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AN
ESSAY
ON THE
PRINCIPLES
OF
HUMAN KNOWLEDGE.

By E. WARING, M.D. *R.*

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THE ROYAL SOCIETIES OF LONDON, BONONIA
AND GOTTINGEN.

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P R I N C I P L E S
OF
H U M A N K N O W L E D G E.

ON IDEAS.

1. **A**N indefinite number of causes of sensation act on the mind at the same time, e.g. Light coming from several objects to the eye; particles of air affecting the auditory nerve; of which the motions are excited by the vibratory motion of the particles of bodies; causes of feeling from every body immediately surrounding us; of smell from all particles acting on the olfactory nerves; of taste from every thing that affects the organ of it; and further different causes of sensation from all the internal parts of the body: the soul though surrounded by such an amazing variety of things capable of producing sensations perceives at the same time only a few of them, which are excited by causes more forcible, more novel, more pleasing, displeasing or painful, or which for

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some reasons the mind is more inclined or compelled to notice.

2. Natural associations of ideas result from the same property of one or all bodies exciting ideas in the different senses, or parts adjacent and connected of the same body exciting different ideas in the same sense, e. g. The tangible idea of distance is associated with the visible and these with the audible idea.

3. Accidental associations are such as have happened from accidental circumstances to particular animals.

4. The memory retains in some degree these perceptions, and recollects the ideas accompanying and immediately succeeding each other: Two things connected together in our past experience, will either more or less be connected or associated or successive in the memory, and from the one we may often deduce the other with more or less facility, e. g. We are sometimes puzzled to remember some word or matter, and in order to the finding it we endeavour to recollect every thing allied, to recollect the letter (sometimes by recalling different letters of the alphabet into the mind) or syllable that begun or even ended &c. the word; or some circumstance connected with the matter; and from this recollection we often find the word, or matter more or less accurately, accord-

according as its remembrance remains more or less perfect.

5. The memory from some circumstances often does not recollect others allied, but from other or several others united may: e. g. We often from the name cannot recollect our past knowledge of the person, or the name from seeing the person, but from this we may remember to have seen him before; and sometimes though we do not recollect him from seeing his person, we remember him from seeing his person and other circumstances.

6. By memory our ideas are associated together, and from thence arises all our knowledge and converse: it is the foundation of our knowledge, for by it we argue from the past to the future; and it is the foundation of our converse, for by hearing the discourse of another, we are led to the recollection of something analogous to what has been said, which we return in answer: the mind from its faculties often annexes ideas together, which were never before associated in the memory.

7. The mind in all its faculties is limited, it can only distinguish even simple ideas to a certain degree, which considerably differs in different persons; e. g. The difference between two colours or two sounds nearly the same, or two angles or magnitudes nearly equal, can often

not be perceived; and when the mind can perceive no difference between colours or sounds, angles or magnitudes, it will conclude them to be the same or equal.

It is known, that the rays of light coming from the same point of an object do never perfectly unite on the same point of the retina, but intermix with rays coming from adjacent points; and if they do not separate too much from each other, or the force of the rays coming from the other points bear too great a ratio to the force of the rays from the first mentioned point, the vision will be distinct and not to be distinguished from perfect vision; in which all the rays from one point of the object are supposed collected in the same point of the retina and not intermixt with other rays; and the same may be predicated of all correspondent points.

The like may be affirmed concerning sounds and ideas arising from the other senses; and this limitation of our faculties may hereafter become the subject of calculation.

8. Several causes, which produce simple ideas, may when united and acting together on the same point of the body or nearly, produce one simple idea in the mind, and that most frequently not the same with any of the before-mentioned, e. g. The causes of several colours united

united on the same point of the retina generally produce a different colour; and so of several sounds united on the same point of the auditory nerve; and consequently the cause of a simple idea is often reducible into several causes of other simple ideas.

9. The ideas received in the mind are not only different as the object from which they proceed is different, but also as the constitution of the organ of the percipient is different; e. g. Let a man have a microscopic eye, or which is the same, view the object by help of a microscope, how different does it appear from that seen by the common or naked eye? the same object is calculated not only to give different ideas to different senses; but also to the same whether seeing, hearing, &c. in different persons; or to the same person at different times, or with different instruments interposed, which may greatly vary the sensation.

10. Amongst the innumerable simple ideas, which arise from the different senses, hearing, seeing, tasting, feeling, smelling; no two are similar: the ideas of extension, figure (a particular mode of extension), and motion received by the eye are quite different from those received by the touch; but being found generally to accompany each other, as they are produced by the same body, we associate them together, and give them the same name.

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11. Innumerable sympathies from nature pervade the body (as is known to all the faculty of physick), which are often different in different constitutions: innumerable associations of ideas arise from nature, from custom and habit and from artifice; some ideas of sight give pleasure to the whole, and some to parts of the body; others produce disgust, horror or pain; some sounds create pleasure to the whole constitution, others tremblings, rage, fright, &c.

12. Some are general associations; for example, when the ideas are derived from the same cause; the idea of extension from sight and touch; of a carriage from the sound of it: others belong only to particular persons occasioned either by their constitutions or particular events of their lives; general associations of ideas and of facts deducible from uniform experience constitute the foundation or principles of human knowledge. All languages consist in the association of sounds with other ideas.

13. As the same machine to a person skilled in its several parts appears much more complicate than to a person ignorant of them, who knows not how to distinguish the different parts; so an idea may appear more complex to one than another; and probably the idea, which first enters the mind must be simple; afterwards the mind

mind receives ideas, which agree in some but differ in other parts, it then separates the parts which agree from those which do not; and the simple idea becomes a complex one; these may be called complex in their nature or substances: arbitrary ones are formed by adding several simple ideas together.

14. Ideas and effects which always accompany each other, are supposed to be derived from the same cause, e. g. If a body is interposed between our two hands they cannot come together, this is an effect not a simple idea probably produced by the body interposed between the hands; if the sensation produced in the mind by feeling be called solidity, solidity in one body will be quite different from solidity in another, and neither one of those can be proved to be the cause why the hands do not come together; but it may be said, that what produces them likewise keeps the hands from coming together, the consequence is that they may both be concluded properties of the same body, but no more deducible than other properties from each other.

15. Extension is a property of all bodies, the idea of it is acquired by the touch: and all its measures as inches, feet, yards, miles, &c. derived from thence.

16. From the same cause, as before said, is derived

derived a correspondent idea by the sight which always accompanies the former; when different ideas are derived from the same cause, we associate them together in our mind as we find them from experience, e. g. We have found bodies greater to the touch when the picture on the retina is greater, if the distance from the eye be the same; we therefore judge of the greatness of one from the other: from the angle which the objects subtend at the eye, the light and shades, distinctness and greatness, &c. ~~of a known object~~, do we judge of its tangible distance, size and shape according to past experience; and the same principles which we have deduced by experience from known objects do we apply to unknown: in general from an idea of one sense, we can seldom judge with much accuracy and precision concerning an idea excited from the same cause through a different sense; but in the case of our ideas of extension from sight and touch there is an exception, by making use of both together: we are able to extend our measures by touch alone to a small distance, but by taking two different angles by instruments accommodated to the sight, at a proper and known tangible distance from each other; and the same for more angles and distances; and by supposing the motion of the earth and heavenly bodies to be conformable to past observations
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and experience we can extend this measure to distances almost as far as imagination can reach, and prove that the eye extends its view to inaccessible distances, to millions, billions, and trillions, and a space equal to sextillions or nonillions of miles; but to how much further the naked eye, and much more assisted by telescopic instruments, views, can never be investigated: stupendous, immense, perceptible space! through the whole of which are interspersed indefinite systems of bodies equal to our own; how small and contemptible is the world which we inhabit to our system of Sun, Planets, Comets and Satellites? how little the space that a single person inhabits to the world? infinite creation! yet every part connected, communicating, affording light, and probably attracting and giving vigour, &c. to each other; therefore only one infinite machine, proving by the communication of its parts, the omnipotency and the unity of its supreme Architect; power infinitely superior to human comprehension.

17. But great, infinite as the creation is in its extent, it displays in its smallest parts, in man, in other terrestrial animals equal power in miniature; the number of vessels carrying blood and various other juices, of glands secreting them, of nerves affording life and action to every part of the fibres which consti-

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tute the muscles, vessels and other parts of the body is never to be investigated, I may venture to say, that they are innumerable; the whole world filled with animals innumerable, most of them imperceptible by us, as is probably all the other creation.

18. Such is the infinite power of the Creator, nor is his wisdom and goodness less displayed, were we endued with faculties able to comprehend them; i. e. Were the understanding equal in force to the sense; infinite wisdom and goodness always accompany each other. Wisdom consists in seeing what is necessary for the well being of any animal, goodness in giving the means affording it; from the goodness therefore given we deduce the wisdom. At a great distance worlds to our view are crowded into points, and only can barely be seen, not the living animals or various other parts contained in them, and consequently not their contributing to the well being of each other. Our senses are not calculated to afford us much insight into things at a great distance which could be of no benefit to us, our understanding is limited even to the knowledge of a very small part of the wisdom displayed in the things with which we are surrounded and conversant. Our minds are better formed to see the uses, than to examine the mechanism
from

from which they are produced; and we feel and are more convinced of the utility of any thing by being deprived, than by constantly enjoying the benefit of it: e. g. Let man be deprived of food, he soon becomes well convinced of the utility of it for the support of life; let him be deprived of a leg or an arm, and he soon perceives how useful it is to his well being; let him be deprived of his heart, his lungs, &c. and it soon appears how necessary they are to his continuance in life: cut off the extensors and flexors and muscles of the legs, arms, &c. and it will immediately appear how necessary and useful they are to the extending, bending and moving of their respective parts; cut off the blood vessels belonging to any muscle, and the muscle immediately becomes inactive; cut off the nerve of any part, and it loses its life and motion; in the same manner we may descend to the inferior vessels and parts, and shall find them all necessary to the support and well being of the superior; and this may be carried perhaps in infinitum, could our senses afford us information so far downwards.

The mechanism therefore infinitely surpasses our understanding; which extends not so far as from the parts in the least to investigate their uses, but it deduces their uses as before seen from a deprivation of the parts.

19. We judge of the wisdom and utility of a machine from the effects produced, and the contrivances employed in producing those effects.

The effects produced, are every thing in the creation that we know and all beyond our knowledge; in ourselves are life, self-motion, understanding and will; faculties beyond which the human comprehension cannot proceed, and never to be produced by us; and the contrivances are infinitely above our understanding, such as no human mechanism can in the smallest degree equal, nor human sagacity conceive, but infinitely superior to both; indeed all our knowledge, our power and abilities are given and contained in the above effects.

Can Omnipotence, and Omniscience, proceed from weakness and ignorance? do not the power, and wisdom, displayed in the works of the Creation, their mutual connection with each other, demonstrate the infinite power, wisdom and goodness, the unity and omnipresence of its Creator.

20. And yet notwithstanding the unbounded creation mentioned, perhaps for any thing that we know to the contrary, there may exist a spiritual world, not to be seen by our senses and our place of existence in a future state.

21. The ideas of sounds and all other ideas,
that

that can be received from a body at a distance and vary with the distance, may be said to be connected with the tangible idea of distance; the more distant the body, the less the light, the sound, and smell, &c; we may also from these senses judge somewhat of the size of the body; for the larger the picture on the retina, the more light, the louder the sound, the stronger the smell, &c. the larger, *cæteris paribus*, is generally the body: from these different sensations, therefore, we may form some judgment, probably very inaccurate from want of sufficient experience, concerning the distances and size and figure, &c. of the bodies: the more widely different the sensation at different distances, the more sensible at every distance, the greater experience, and the more attention either from utility, nature, or any other cause paid to these sensations and their correspondent distances; and the greater the memory of such matters either from nature, or acquired by habit, the more accurate will be the judgment concerning the tangible distance; the sight, for these various reasons, best judges of the tangible, and is the only sensation that extends to a very considerable distance; the sound claims the second place; from the difference in time between the sight of any action of an object, and the hearing of that action, we can judge in some degree of the distance of the object:

ject: the same may be affirmed of the sensations from the smell, &c. for they are principally conveyed to the mind by the air.

ON THE FACULTIES OF MAN.

1. The mind, as some commentators on Euclid have observed, derives its ideas from sensation or the organs of the body, reflection and memory.

2. The ideas from sensation first enter the mind, it neither creates nor alters them, nor a fortiori communicates them to others; they must go to the external objects to acquire them; whether those ideas are exactly the same in two different persons, or in the same person at different times, has been before determined; but they are sufficiently analogous to produce correspondent ideas.

3. The mind reviewing those ideas of sensation, compares some of their qualities together, whence it acquires the ideas of relation: if the ideas compared together are derived from some particular bodies, we get ideas of comparison, as brighter, whiter, acuter, louder, sweeter, (which is applied both to taste and smell, though there is no association unless in the name between them, which is the case of many words), &c: the comparison may be of different degrees, as their difference may be little, much,

much, very much, &c. but rarely becomes the subject of calculation. These all depend on the greatness, the vividness or strength of the ideas excited in the mind.

The relation is contained between two or more ideas, and without those ideas being in the mind, the relation cannot be perceived. This relation, to use Mr. Locke's language, is the agreement or disagreement of ideas, &c. The perception of it is knowledge: many relations are contained between all or very many ideas, and may be called universal or general propositions.

4. There are relations, which are not acquired from any quality or property inherent only in some particular bodies, but equally from all ideas of the mind; and consequently cannot be said to be produced in the mind by any quality of the body or sensation, but rather by reflection of the mind itself; of this kind are the ideas of identity and diversity, existence and co-existence; number as one, two, &c; time (by the succession of ideas present, past and future); thinking by reflecting on the ideas of the mind (bare perceptivity includes every sensation), volition, &c. and this may be done by different degrees from bare perceptivity or simple apprehension to the highest stretch or degree of attention possible; and from irresistible desire to the slightest inclination.

5. Affections

5. Affections and passions of the mind are neither sensations from external objects, nor perceptions of some of their relations, but, if I may so term it, feelings (not the sensations of the touch) from some properties of them or their relations; and only to be acquired and defined by mentioning the causes which produce them, and referring to the feelings excited by those causes, e. g. Joy and grief, pleasure and pain, which often originate from the mind; sublimity from the grandeur of a sensation on the ear or eye exciting a more strong impression; beauty from some pleasing sensations from objects to the eye; pity from viewing and reflecting on living animals in pain or distress; love, being a pleasure received from one of a different sex; friendship from one of the same or different; anger from a conception of some injury offered; gratitude from some good received from another person; a sense of piety from the considerations of the power, wisdom and goodness of the Supreme, and our dependence on him, and some feelings either greater or less almost from every object and relation.

6. The mind can retain the same ideas in it for more or less time, but it is limited in every thing; it can think only on one subject at once, and other ideas will obtrude themselves contrary to its will: the attention of any man may be

be greatly increased by frequently reflecting on a subject for some time together.

7. The idea of the will is acquired from the power a man has of retaining his ideas, or letting them pass; of considering their relations or not, &c.; and principally from the power of the mind on the actions of the body; it can make the body or several parts of the body move in any direction or prevent their motion; it can perform several actions or not perform them: the powers of man are here very much limited; he may will or desire things, which he cannot attain; and even the will or desire is in some degree limited, and from duty ought to be more so.

Many things influence the will of man, and even so much as to produce a very great probability, that the man will follow their directions; motives influence but not compel, e. g. The avoiding pain, the procuring pleasure, the passions, self preservation, &c.: man ought in every thing to subject his will to the will of God; but in things of less moment, where no command is given by the *Supreme* or can be deduced, he may govern himself by his own ease and happiness according to his will directed by his feelings and understanding.

Much has been argued on the freedom of human will; what is meant by human will,

but the power man, as before said, has of walking or not walking in any manner; acting or forbearing to act, or acting in a different way; conversing on one subject or other, or being silent; &c. that a man has such a power seems to follow from his having framed a word to express it, by which he means something in opposition to necessity; but as all our knowledge is deduced from experience, every man must determine for himself; if he finds himself necessitated to walk or act in the very manner he does, and that it is not in his power to do otherwise, as much as it is not in his power to fly; all the words in the world will never convince him that it is, no more than reasoning will prove to him that it is in his power to fly; but if from his own experience and observation he finds that he can either do one thing or the other, and that the Lord and Governor of the universe orders the one; then he becomes accountable to that being for his acting, or not acting agreeable to his commands.

8. It has been urged that such freedom of action is incompatible with the divine foreknowledge; whoever advances this proposition must shew that there is an express contradiction contained in the terms; which no one can: the powers given to man may be shewn as far to exceed his comprehension as the compatibility

bility of divine foreknowledge and freedom of will; I may venture to say that probably innumerable attributes of the deity unknown to us, and all carried to their utmost extent, surpass human comprehension: nothing is impossible to omnipotence; the impossibility must be contained in the contradictory terms. In this case human understanding can go a great way, can frame a probable conjecture of the actions of a man, with whose character they are acquainted, though the man is perfectly free in those actions: but what is probable with man in some cases, is certainty with God in all.

9. It has been further argued that every effect has a cause, if it be said a necessary one, it is begging the question; if a voluntary one, the question is granted: if the effect be the acquisition of motion from one body striking another, the law is of course given by the supreme to the striking body to communicate such a degree of motion to the body struck, as probably there is no necessary connection between cause and effect; if it be asked what is the cause of the one body striking the other; it may be answered, its motion acquired from the striking of other bodies, and so on (unless voluntary causes intervene) till we come to the creation itself and consequently to its creator.

10. If the effect be the motion of the body from

the action of the soul on it, then the cause of the action of the soul on the body is a voluntary one, viz. the will of the soul, i. e. a power given by the supreme to the soul of acting on the body, or not, according to its own determination or choice; but does any one doubt that the Almighty could have given such a power? Is there any contradiction contained in the terms? and if there is none he certainly could have given such; the enquiry therefore is, whether he has given it, of this every one must judge for himself from his own faculties.

11. It has further been said, that motives always determine the mind: motive is a general word; in deducing general propositions we argue concerning some particular, which same argument we perceive may be applied to every particular contained in the general term; and if it is true of every particular, we conclude it to be true of the general: hence our reasoning concerning general propositions, can only be from particulars; in this case let the particular motive be the ideas or thoughts of walking this way or that way; which of these two can be called the motive, for they are both equally contained in the mind? is the mind compelled from these ideas contained in it, either to go one way or the other? this motive must necessarily act before the determination of the mind, for if it

does

does not, it means only the determination of the mind, not a motive: but if every thing has a cause, the motive must have a cause; and if the motive has a cause, it can be no other than the abovementioned thought of walking one way; but what is the cause of or determines the motive, determines the will; and therefore this thought determines the will: but to put an end to trifling, the use of general names instead of particular things sometimes produces confusion in our reasoning.

12. The feelings or sentiments arising from moral relations are greatly different in different persons, e. g. The reverence impressed on the mind by the name and attributes of the deity, dread and affection, gratitude, benevolence, the zeal and satisfaction for doing and from having done our duty; the sorrow and repentance for the neglecting or acting contrary to it; these may be increased or diminished by the will influencing more or less attention to them.

13. Pleasure and pain also are different in different persons, those from sensation depend principally on the sensibility of the constitution and the part affected, and can only be distinguished to a certain degree: the pain is rendered more acute by the part being inflamed, and less so by its being paralytic; even these the frame of mind may somewhat increase or diminish: joy and grief,
pleasure

pleasure and pain, often originate from the mind.

The pleasure arising from the consciousness of having done our duty, benevolence, &c. is of the purest kind; from profaneness, malevolence and immorality (if there may be found persons, who have pleasure in them as such) is of the most horrible and base kind: there are pleasures from being occupied in business, trade, &c. from the discovery of truth, from the imagination receiving or creating thoughts which are pleasing to the mind, from wit and humour, from the removal of pain or any evil, from conversation and agreeable company and entertainment, from the praise of men, from the expectation and desire of any particular pleasure, from selfishness or the thoughts or wish of any thing accruing to our advantage, from feelings, &c; and pain and uneasiness from some of these as well as the contrary. These pleasures and pains may be all different in kind and degree in the same, or different men

14. The ideas acquired from sensation are quite different from those, which the memory retains, they can hardly be said to have the least resemblance: from a stroke on the eye or casual occurrences probably from some action on the retina, ideas of the sight are excited as vivid and clear as from sensation itself; or sometimes

even

even more so: when we are awake our ideas are always passing in review before us; but even in the ensuing day, we do not remember the $\frac{1}{100}$ th part of the ideas or propositions that were in our thoughts the day before; as a microscopic eye would render us unable to view objects at a distance, (a similar proposition may be asserted of the ear, &c.), in like manner if the memory was more retentive and recorded all the trifles that passed, the mind would be too much and to no purpose incumbered with them; and since we cannot think or reason on more than one thing at once, the retaining of them would be of no use, it would render us incapable of conducting the things most material; and as our time is not much more than sufficient for that purpose, therefore it is more advantageous to forget than remember them: all our senses are calculated for the greatest utility in our present state, but nature wisely uses a considerable latitude in all her operations.

15. Sometimes the most material and striking things are recollected, not without difficulty; and were there no other means of preserving the recollection of past events than the memory of man; almost every thing, that ever entered his mind ten years past, would be entirely forgot,

forgot, (matters of much moment are generally recollected and repeated from time to time), and accounts of business between one man and another could not be long kept; and even affairs of the greatest moment, viz. religious, would soon die away, as would every thing else, but what is necessary for our subsistence, and must be constantly transmitted from one to another: we should be sunk into the state of barbarism, which pervades the original natives of Africa, or America; but art or a benevolent and good being, by whom all useful arts are given to mankind, has substituted another memory, and supplied by letters the defect; and afforded the power of continuing every thing useful, not only during our own lives, but through after generations.

16. The ideas of sensation contained in the memory, as is before mentioned, can hardly be said to be a resemblance; but the ideas of the general relations abovementioned, arising from all ideas whatever or rather from reflecting on them, must be equally clear to the mind, whether any other ideas are contained in it or not.

17. The memory, as all the other faculties, may be improved by proper exercise of it, that is by learning, particularly in our younger age, to repeat lessons contained in books, &c. But though it will be improved in general, yet it will

will be more particularly so in things allied to the lessons themselves: attention and repetition fix things in the memory; by the first reading men of moderate abilities acquire and retain but little knowledge on a subject in which they were not conversant before, but repeated readings make it their own; and sometimes events, &c. may more easily be remembered from some technical words or verses framed for the purpose, of which a key is given, or from many other marks or signs: the more frequent, the less distant in time, the more vigorous our attention, and the more our ideas are allied to others in which we are conversant, the more easily shall we recall and review them in our mind and their order, accurately and distinctly: the reflecting with great attention on one thing for a considerable time tends to obliterate others, things of greater moment to obliterate those of less.

11. In the delirium arising from a fever and some other disorders, the mind cannot command the succession of its ideas, nor the subject of its thoughts; it will rove on things, which perhaps have been entirely forgot for a long time: I knew a person, who in that state repeated in his mind verses of some of the English poets, or composed new rhymes as fast as his ideas could well succeed each other, both of which he was unable to perform, when freed from the deli-

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rium : a gentleman of undoubted veracity assured me, that in a delirium he constantly roved on passages from novels, which he was not able to repeat before or afterwards.

12. Knowledge has been defined to be the perception of the agreement or disagreement of our ideas; but what is meant by the agreement or disagreement of our ideas? does it mean their relation to each other, either affirmative or negative? and in such general expressions, not easily to be defined, does not the latter seem to carry with it a more general signification? e. g. Agreement in lines seem to imply equality, and disagreement inequality, not other relations; if so, may not knowledge more properly be defined the perception of the relations of our ideas? or perhaps in this manner, the perception of the properties of substances and their relations, and the relations of our ideas and feelings? but definitions, exprest in such general terms not easily comprehensible, seldom can be said to be of much utility.

ON FEELINGS.

1. Sensations and relations are generally correspondent in man, they may be stronger and more impressed on the memory by a greater attention of the mind, but in most other respects do not much vary.

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2. The feelings are denominated from the causes which produce them; but those arising from the same cause are often widely different, or even opposite in the same person at different times, and in different persons.

3. The most forcible and violent, are called the Passions, and distinguished according to their causes, as before said, and not from the feelings in the mind: e. g. Love, excited by viewing one of a different sex; anger, by some action of another person; but, in conformity to what has been before asserted, the cause which produces love in one, may create aversion in another; or that which creates anger in one, may not irritate another.

4. Those from our moral duties, as gratitude, filial reverence, benevolence and piety, are in men of exalted goodness and piety of the first degree of strength and force, in most men of the second, and in bad men of little or none.

5. All our feelings may be altered, corrected, exalted, or debased, by various causes, circumstances and reasons; and confirmed by habits.

6. The pathetic being excited by the considerations of some living animal in present, or likely to be in some future distress, will be a passion when strong, when weak a bare feeling, a moral one if it arises only from duty.

7. Pleasing feelings are forcibly excited from the

acquisition of very useful and desirable objects, from esteem and other causes; and in some degree from most sensations, from novelty, variety, different dispositions of parts, and the generality of things occurring. Displeasing from their opposites. They are probably given us for general use, and we may commonly deduce what sources are agreeable and what are not, from scrutinizing their uses to mankind; e. g. Novelty is a pleasing feeling, particularly in young persons, probably given for an incitement to acquire knowledge necessary for their future well-being.

8. If beauty and sublimity were defined to be whatever is pleasing to and forcible on the mind, then would beauty be contained in the generality of things, and the passions would be the most sublime; but they must be defined, as all other feelings are, from their causes: these causes have not been accurately defined, and consequently it cannot in general be said what is sublime and beautiful, and what is not. Are these causes contained in sensations, or the understanding, or both? If beauty is derived from the sensations of sight alone, is it not from a pleasing light and colour? If sublimity is excited by the sensations of hearing and seeing, does it not consist in the grandeur of the sound, or the greatness and light and colour
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of the object? But if beauty and sublimity is contained in the sensations and sentiments, then may not the former be said to be an object pleasing by its light and colour; and in its qualities, proportions and order, agreeable to utility and nature? and sublimity, the latter, with grandeur and greatness? but if the sensation be only contained in the memory, and consequently cannot in itself have any great impression, then it must be principally from the superior excellency of sentiments in the one case connected with pleasingness, and in the other with the grandeur of its objects. The attributes of the Deity, his power, his wisdom, his goodness, are the most sublime conceptions, and perhaps that of Mr. Huygens, that innumerable systems of worlds are dispersed through the creation (God said, Let creation be, and innumerable worlds arose) is the most sublime thought that ever entered the mind of any person not inspired: it has truth, utility and grandeur united; it carries our thoughts beyond our conceptions: in contradiction to truth and nature no thought can be excellent.

9. It has been said, that terror is the principal source of the sublime; if this be the case, then a person presenting a pistol to the breast is a sublime object: but thunder is a very grand and sublime sound; take away the sound, and would
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the terror or fear of the danger be esteemed sublime? but every one may affix whatever meaning he pleases to the term, the feeling will be different in different persons, and vary with repeated usage.

10. The ideas from memory almost immediately following the sensations have no resemblance to them; for if they had, we should not be able to distinguish between the presence and absence of the object: but it is different in feelings; for strong feelings generally continue for a considerable time (in some longer than in others), but commonly grow more weak by time and company.

ON THE IMAGINATION, &c.

1. The mind can recall different ideas into its view, into itself, from its storehouse the memory; and join them together in whatever manner it pleases, and further examine their nature and relations; whether they are pleasing, &c. and whether agreeable to nature and truth.

The recalling them into the mind may be named general recollection, the joining of them together may be stiled imagination or fancy, according as it creates images or figures, &c. or connects them in any other way that the mind pleases: reason examines their agreement to nature and truth; and invention finds new relations

lations conformable to them between different facts and ideas.

By the faculties are denoted the actions and passions of the mind.

2. Man has not only the power of recalling ideas into his mind at the present, but also to some degree of fixing what he will reflect on at a future stated time; he lies down to sleep, with a resolution that he will recover his ideas in six hours, he accordingly wakes about that time more easily if it be his accustomed time: man likewise determines to consider some matter, or perform some business six days hence, he very seldom fails in this, unless by change of inclination, or something happening in the mean time, which prevented him. A power to us necessary, but incomprehensible; but so are all given, traced to their origin.

3. If man was not endued with such a power, he could not be accountable nor conduct himself through life; for he could not say, what would be the subject of his thoughts at any future time.

4. If the mind keeps any idea or subject in it for any considerable time, there will necessarily accompany it many things similar or allied; but when the mind's attention is not fixed much on any thing, there will enter it a great variety of things often of little use.

ON HUMAN KNOWLEDGE.

1. There is no necessary connection known to us between cause and effect.

Can any person by reasoning independent of experience from the cause deduce the effect: no one ever has, and consequently to mankind there is no necessary connection known between cause and effect.

2. Is it probable that any necessary connection is contained in their own nature?

When the Omnipotent created the world, he probably assigned to all things in it their connections during their existence; e. g. 1. That action and reaction should be equal and contrary. 2. That one body striking another should, in given circumstances, communicate to it a certain degree of motion. 3. That some ideas in the mind should always accompany or succeed others; but could not the Almighty have assigned different connections? From his Omnipotence, I argue, that he could; and if this could have been the case, there is no connection in their own nature between cause and effect; and consequently the latter is not necessarily subsequent to or deducible from the former, but entirely dependent on the Almighty fiat.

3. Some of these connections are such, that even the possibility of them seems to exceed the human

human comprehension, and would not be credited, were they not warranted by experience; viz. the actions of the body following the will of the mind; e. g. We desire to move a body, and in order to produce this effect we must contract or extend to a certain degree several muscles, consisting of almost innumerable fibres; but to contract or extend the fibres of these muscles, a proper quantity of nervous influence must be applied to each, and a due quantity of blood and other fluids injected into or expelled out of them; we are ignorant of the quantity and application of each of these, and of the connection between them, i. e. we are entirely ignorant of the means, which appear almost infinitely complicate, and yet when the parts are not disordered, never fail to produce the end. Could an architect build an elegant and useful house, or raise a great weight by a wish, or by using means without any knowledge of them, though well acquainted with the materials; should we not esteem it the work of an invifible agent? we must from a parity of reasoning, conclude the effect produced from a wish by a being totally ignorant of the means to be applied, a work of the same nature; and by how much the more complicate and difficult are the means, by so much will the action appear more wonderful; and such powers which are far beyond

our comprehension, and seem to us almost impossible, can only be given by the ALMIGHTY.

4. Since no necessary connection is known to us between cause and effect, all our knowledge on that subject can only be deduced from experience.

5. The first principles of some sciences generally stiled self-evident or intuitive, from which the demonstrative propositions (being included in and consequently deducible from them) are derived, seem to have the same origin: e. g. Two things which are equal to a third, are equal to each other, is esteemed a self-evident proposition; but is probably acquired by putting two things which are equal or agree to a third, on each other, and finding that they are equal or agree together: similar reasoning may be applied to several axioms of Euclid.

6. From experience we learn, that definite causes produce or precede definite effects; and further, what effects united are preceded by certain causes.

7. By experience we conclude from things past to the future, and when the analogy is properly instituted, i. e. the preceding circumstances or qualities are well known and all agree, the events seldom or never differ; the more the preceding qualities are which agree, the greater on that account the probability of the

the events being the same; but from human reason there cannot be assigned the least ground for the conclusion, e. g. From the sun's having risen ten thousand days, we argue that it will very probably rise on the subsequent; but who can give any proof of this opinion? I know that some mathematicians of the first class have endeavoured to demonstrate the degree of probability of an event's happening (n) times, from its having happened (m) preceding times; and consequently that such an event will probably take place; but, alas, the problem far exceeds the extent of human understanding: who can determine the time when the sun will probably cease to run its present course?

8. From greater experience we generally conclude a greater degree of probability, though we cannot assign a reason for it.

9. All reasoning on probability is founded on ignorance; if we know no reason for the contingency of one event in preference to another, we conclude the probability of the former event's happening, as far as our knowledge extends, to be equal to that of the latter.

10. 1. If there are two different arguments entirely independent of each other in support of a fact, whose probabilities let be $\frac{p}{a}$ and $\frac{q}{a}$; then will the probability in support of the fact result-

ing from both arguments be $1 - \frac{(a-p)(a-q)}{a^2}$; for, if the probabilities in support of it are respectively $\frac{p}{a}$ and $\frac{q}{a}$, then will the respective probabilities of its failing be $1 - \frac{p}{a} = \frac{a-p}{a}$ and $1 - \frac{q}{a} = \frac{a-q}{a}$, and consequently the probability of failing from both will be $\frac{a-p}{a} \times \frac{a-q}{a}$, whence the probability of the fact resulting from both arguments will be $1 - \frac{a-p}{a} \times \frac{a-q}{a}$.

In like manner, let there be (b) independent arguments in support of the fact, of which the probabilities are respectively $\frac{p}{a}, \frac{q}{a}, \frac{r}{a}, \frac{s}{a}, \frac{t}{a}, \&c.$; then will the probability resulting from the whole
$$= 1 - \frac{(a-p).(a-q).(a-r).(a-s).(a-t).\&c.}{a^b}$$

 $= P.$

2dly. If there are b' independent arguments against the abovementioned fact, whose probabilities let be $\frac{p'}{a}, \frac{q'}{a}, \frac{r'}{a}, \frac{s'}{a}, \&c.$; then the probability resulting from all the arguments against the fact
$$= 1 - \frac{(a-p').(a-q').(a-r').(a-s').\&c.}{a^{b'}}$$

$= Q;$

$=Q$; and the probability of all the arguments for the fact will be $P-Q$, if P be greater than Q ; or against it $=Q-P$, if Q be greater than P .

The sum of all the independent arguments for and against an event's happening cannot exceed certainty (1).

11. If the denominator or number of possible ways (a) be infinite, and the numerators or chances of the event's happening $p, q, r, s, \&c.$ be finite; the chance of a successive event's happening will be infinitely small, though it has succeeded any finite number of times: the success of it nearly proves it to happen from a fixt and determin'd law: from universal experience every event clearly happens from a fixt law, though we may be ignorant of the continuation of it.

12. Let the probability of the events $A, B, C, \&c.$ happening in any one trial be respectively $a, b, c, \&c.$ and certainty E ; then the probability of the events $A, B, C, \&c.$ happening respectively $b, k, l, \&c.$ times in n trials may be express'd by a

fraction, of which the numerator is $\frac{n}{1} \cdot \frac{n-1}{2} \cdot$

$$\frac{n-2}{3} \cdot \frac{n-b+1}{b} \times \frac{n-b}{1} \cdot \frac{n-b-1}{2} \cdot \frac{n-b-2}{3} \dots$$

$$\frac{n-b-k+1}{k} \times \frac{n-b-k}{1} \cdot \frac{n-b-k-1}{2} \dots$$

$n-b$

$\frac{n-b-k-l+1}{1} \times \&c. \times a^b \times b^k \times c^l \times \&c.$ and denominator E^n .

Cor. If all the events possible in the trials are included in $A, B, C, \&c.$; then $E = a+b+c+\&c.$

13. Let the probabilities of the events $A, B, C, \&c.$ happening in each trial be, as before, $a, b, c, \&c.$ and certainty E ; and the probability of the events $G, H, I, \&c.$ happening in each trial in another case be $a', b', c', \&c.$ and certainty F ; then will the probability of the events $A, B, C, \&c.$ happening $b, k, l, \&c.$ times in n trials, and the events $G, H, I, \&c.$ happening $b', k', l', \&c.$ times respectively in m trials be a fraction, of

which the numerator is $n \cdot \frac{n-1}{2} \dots \frac{n-b+1}{b} \times$
 $\frac{n-b}{1} \cdot \frac{n-b-1}{2} \dots \frac{n-b-k+1}{k} \times \frac{n-b-k}{1} \dots$
 $\frac{n-b-k-1}{2} \dots \frac{n-b-k-l+1}{l} \times \&c. \times m \cdot \frac{m-1}{2}$
 $\dots \frac{m-b'+1}{b'} \times \frac{m-b'}{1} \cdot \frac{m-b'-1}{2} \dots \frac{m-b'-k'+1}{k'}$
 $\times \frac{m-b'-k'}{1} \cdot \frac{m-b'-k'-1}{2} \dots \frac{m-b'-k'-l'+1}{l'}$
 $\times \&c. \times a^b b^k c^l \times \&c. \times a'^{b'} b'^{k'} c'^{l'} \times \&c.$ and denominator $E^n \times F^m$.

Cor. 1. If all the possible events of the trials are

are included in the events $A, B, C, \&c.$; and $G, H, I, \&c.$ respectively; then will $E = a + b + c + \&c.$ as before, and $F = a' + b' + c' + \&c.$

The same principle may be applied to any number of cases of a similar kind.

14. 1. Hence by addition may be adduced the aggregates of any similar quantities to any number of different values of $b, k, l, \&c.$; $b', k', l', \&c.$; e. g. When $b = \frac{1}{2}n, \frac{2}{3}n, \&c.$, or greater or less than $\frac{1}{2}n, \&c.$ by given quantities; or like aggregates, when the above mentioned quantities $b, k, l, \&c.$; $b', k', \&c.$; $\&c.$ are greater or less than or in any given proportions or relations to each other.

15. From all but one of the above mentioned independent quantities being given in each of the equations, can be deduced that one; which may be done from the rule of false, when near approximate values of the unknown quantities required are known; i. e. values much more near to one or two, $\&c.$ roots or values of the unknown quantities, than to any other; in the first case a still more near approximate may be found from the resolution of a simple equation; in the second from the resolution of a quadratic; $\&c.$ or if the values of all the correspondent quantities are known in a case where the quantities differ very little from the quantities in the given equations, similar principles may be

be applied for the investigation of more near approximations.

16. These principles may be applied to the investigation of the probability of the truth of the decision by any number of voters, and many other cases; a, b, c , &c. denoting the probability of any voter voting truly, suspending his vote, or voting contrary to truth: and similarly of more decisions, &c.: but it is impossible to determine the knowledge, integrity, and various influences which actuate each person, and consequently to determine the probability of their voting truly, &c.

17. Similar propositions may be deduced, when in every trial any of the quantities a, b, c , &c. is diminished by x , from the theorem $(a+b) \cdot (a+b-x) \times (a+b-2x) \dots (a+b-(n-1)x) = a^n + na^{n-1}b + n \cdot \frac{n-1}{2} a^{n-2} \cdot b \cdot (b-x) + \&c.$ given by me in the Philosophical Transactions and in a pamphlet published at Cambridge on Translation of Algebraical Quantities into probable Relations, &c.

The belief of the fact ought rationally to be proportional to the probability when found; what has been given in the preceding articles may be applied to the subsequent concerning testimony.

18. Since we know nothing concerning the ultimate

ultimate causes of events or appearances, every thing may be supposed to have varied an infinite number of ways without any absurdity or contradiction from human reasoning, to none of which can human understanding give a preference from any argument but utility, and most commonly not even from that: if the number is infinite, the probability of their happening in any one is infinitely small; e. g. The sun, the earth, the planets, comets, stars, &c. might be supposed to have moved in an infinite number of directions; they might have been situated in as many different positions; their diameters, figures, densities, forces, &c. might have varied infinitely without any proof to the contrary being deducible from human understanding, and the same may be affirmed truly of most things in the constitution of the world: every thing has its laws affixed by the Creator.

19. Probability or chance is the offspring or creature of imperfect knowledge; or, which is the same, partial ignorance: every thing is created certain in itself; to perfect knowledge therefore every thing is certain: on the other hand, total ignorance affords not the least appearance or knowledge of the subject or its probability.

By chance or probability I mean its extension from certainty to impossibility.

20. To beings situated in an imperfect state, probability, or more properly confidence in the future from the past, is the foundation of nearly all their knowledge, imperfect in itself, and a rule for their actions; e. g. The farmer cultivates his land and sows his corn, on the probability that he shall reap; man carefully provides what is necessary for his future well-being, on a supposition or probability that he shall live to enjoy it; and he should take superior care to secure for himself happiness in a future state, on a certainty of death and firm assurance of eternal life. The less is the degree of probability or confidence of their knowledge, the more on that account imperfect their nature. In human nature probability, or human knowledge, is built on past experience; we know not the constitution of things, and consequently cannot from it deduce the accidents. The same is true in the whole system of living beings contained in this world.

The *Supreme* has imprest on our minds a faculty for the source of all our knowledge and actions; namely, a necessary or impulsive belief of the future from the past, viz. that what has been for the time past of our lives joined together or constantly succeeded each other, will for the future be joined together or be found in the same order to succeed each other. It will
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readily, I suppose, be allowed, that this is not deducible from reason, or any other preceding principle, by the generality of mankind; they know no principle but experience, from which they can argue from the past to the future, and never pretend to assign the degree of its probability.

If mathematicians could, from an event's having happened n times, deduce the probability of its happening m future times, they would proceed one step beyond the rest of mankind; and demonstrate that to be founded to them on reason or a more distant, which to the generality of mankind is founded on immediate experience only.

PRINCIPLES AND RULES OF HUMAN REASONING.

The same mechanical cause always produces, accompanies or precedes the same effect: this is manifest from universal experience; which proves the veracity of the Creator, in whom is no deception, for truth equally appears from deeds as words. Certainty in this renders certain all the works of the creation: on this all our reasoning depends.

Universal experience proclaims every effect to have a cause.

1. If the event A always succeeds the event

B, then the prior event *B* will generally in human reasoning be deemed the cause of *A*.

2. If the event *A* always accompanies the event *B*, then the events *A* and *B* are deemed to have the same cause, whether known or unknown; or causes which necessarily accompany each other.

e. 1. If the body *a* striking *b* always loses a certain quantity of motion at the same time that *b* gains it; then the loss of motion by *a* and gain by *b* are deemed to have the same cause, viz. the action of the bodies on each other; though the loss of *a* may be said to be occasioned by the reaction of *b*, and the gain of *b* by the action of *a*, which necessarily accompany each other.

e. 2. If some properties of material bodies always accompany each other in time and place, we conclude them to have the same cause; though we may be entirely ignorant of the substratum, support or cause.

3. No causes or effects, i. e. preceding or subsequent effects can be concluded, but what are deducible from or correspondent to past experience of similar causes and effects.

4. If some events have regularly succeeded each other in any order, in the same do we expect similar events always to succeed; and the more often we have observed these events regularly to succeed or accompany each other with-

out

out failure, the greater we believe to be the probability of their continuance in that order.

What is asserted in all these cases concerning events, may equally be applied to the composition and resolution of bodies and events; for those compositions and resolutions may be considered as events.

5. The more the events are which accompany or succeed each other in one case, and similarly accompany or succeed each other in another; the greater, *cæteris paribus*, to us is the probability that any other events which accompany or succeed each other in the former case, will likewise accompany or succeed each other in the latter: e. g. The greater the number of properties of two bodies are which agree, i. e. are similar to each other; the greater, *cæteris paribus*, is the probability that the remaining, and, *à fortiori*, some of the remaining properties are correspondent, i. e. similar to each other.

6. If any events sometimes accompany each other and sometimes do not, and it is not known on what depends the contingency or failure; the probability is generally estimated from the proportion of the number of times they have accompanied or succeeded each other in the same order, to the number of times they have failed: the greater the number of trials, the more probable is the justness of the proportion.

7. If

7. If some events accompany or succeed each other, we conclude it probable that events nearly similar to the preceding will accompany or succeed each other in the same order nearly, unless something is known to the contrary; the more widely different the preceding are from the subsequent, the less the degree of probability, and the less the similarity: on the contrary, if the preceding events do not generally accompany nor succeed each other, it creates, as before, a probability that events nearly similar will neither generally accompany nor succeed each other.

8. If the contingency of an event depends on the contingencies of several whose probabilities are given, from the preceding principles its probability may be deduced.

9. Since we always find similar causes to produce or precede similar effects, we are induced to reverse the proposition, and conclude from similar effects to similar causes: all similar causes produce similar effects, as follows from universal experience or truth, we can therefore conclude from causes or precedent events when well known to subsequent; but on the reverse, the same effect may proceed from different causes or compositions of causes; e. g. The same may be the weight, the colour, &c. of different bodies; we cannot therefore conclude from natural effects of the same kind to similar causes, unless

so

so many effects are included as to preclude all bodies of a different kind: if the concomitant effects are some similar and some dissimilar, we commonly conclude the causes to differ.

10. If the properties of two bodies, which do not depend on their different organization of parts, are some similar and some dissimilar; then we shall be induced to conclude, that their substances or substrata differ.

All material bodies are endued with gravity or weight, *vis inertiae*, &c., which never appear to vary differently by any organization; i. e. different disposition of parts that can be made by us; and consequently, when we argue from these properties alone, we conclude the substrata to be similar; but when we consider that the bodies are endued with properties entirely different from each other, as to colour, taste, smell, hardness, &c. we begin to doubt; whether the substrata are different, or whether the properties, which are different do not depend on the different disposition of parts; and it is an additional force to this latter opinion, that we find these last mentioned properties to vary by changing their disposition of parts: if we find every property that does not appear to vary with changing their organization of parts to be similar in different bodies; we from thence conclude the substrata of those bodies to be similar; unless

unless in a similar organization of parts, which can never for certainty be known, and similar positions and circumstances they should appear different to a being endowed with similar percipient powers; for in this case we should think the substrata to differ: this reasoning only concludes the causes to be different, when the effects in the same circumstances differ.

11. If one substance is endued with sensation, perceptivity, understanding and freedom of will, and another not; their properties being very dissimilar, mankind have distinguished them into two kinds of substances, immaterial and material: by material, they understand substances not endued with perceptivity, and consequently always acting necessarily and not voluntarily; for no action can be voluntary without perception and understanding.

By organization of parts, I mean with the vulgar, disposition of parts; and by organized matter, I understand meer matter in a certain disposition of parts; if any thing else be meant by organized matter, then organized matter cannot be said to be of the same substance as meer matter.

12. Many writers have defended the materiality of the soul; but we must from its properties, understanding, freedom of will, &c. being different from the properties of meer matter, conclude the sub-

substratum of the soul to be different from that of meer matter, till we can so organize, or differently dispose the parts of meer matter, that it shall contain understanding, will, &c.

The arguments which I remember to have read in support of it are

1. The soul is immaterial, and consequently immortal: the soul's immateriality, no more than its materiality, proves its immortality; it cannot be deduced from the nature of the substrata themselves, of which we are entirely ignorant; nor can it be demonstrated from any properties of matter or spirit that we know: does present perception, understanding and will, imply their eternity, i. e. their immortality, any more than meer mechanical powers? certainly not. All the properties of either can be deduced only from experience, and from no one property can we derive another, unless it is included in it; they entirely depend on the Almighty fiat.

2. The soul is material, as it receives impressions from matter.

By no reasoning whatever can we deduce the possibility or impossibility of the action of one material substance on another, and as little of material or immaterial substances on each other, they can only be discovered by us from experience; and experience teaches that all things known to us, however widely different in their

properties and nature, do mutually act on each other, whether material or other substances.

We know not what common properties any material and immaterial substances may have, they may be endued with many; and a future state may discover to us many common and other properties, of which we at present have no conception, notwithstanding any thing that can be asserted to the contrary; indeed we know (comparatively speaking) very few of the properties of either; but it can never be concluded from human reason, that substances which have no common property must be incapable of all mutual action: is any contradiction or absurdity implied in the term? The Almighty has no common property with material substances; is he therefore incapable of acting on them?

3. If the soul was immaterial, there would be no occasion for material organs to convey to it any information. If there were not different kinds of immaterial substances, i.e. substances not material; and consequently our soul was endued with all the same properties, and of the same substance as the *Supreme*, then the argument would be conclusive; for the Almighty needs no material organs: but if there are different kinds of immaterial substances, no one can say what other immaterial substances may have occasion for: I believe that there is occasion
for

for whatever is; and particularly in this case, as I see the material organs produce the most useful and admirable effects, being the grounds of all our knowledge and support in this state; in another state these organs may be changed.

I know no proof, that there are not different kinds of material substances, and that all material substances have the same properties; and their difference only depends on their different disposition of parts: no one has yet discovered the philosopher's stone, or art; by which he can change, by differently disposing the parts, every species of matter, into gold, or any other substance: the same may be advanced concerning immaterial substances; the Almighty fiat is the only general specific of this sort.

4. Neither age, nor experience, nor the growth of a body, can make an immaterial person more rational.

Of this, as other matters, we can only reason from experience: the properties of meer matter; the action of one material substance on another in the same circumstances, will, as appears from experience, be the same at all times; the infinite properties of the Supreme, his *knowledge*, his *wisdom*, his *power*, his *goodness*, &c. never increase nor diminish; but the properties of inferior spirits or inferior immaterial bodies vary, improve, increase, diminish, &c.; the under-
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standing

standing in all its branches, the will, the strength of the action of the soul on the body as in part appears from self-motion; and the vivacity of ideas excited by the action of the body on the soul, &c. vary. Attention and experience certainly increase and improve our knowledge; and by them and the habit of body, the faculties of the soul are rendered stronger or weaker: by experience and observation, principally arising from the soul, its knowledge and faculties are most increased; and by the habit of body the loco-motive powers of it: from experience it rather appears, that the mind is more capable of being improved while the body is in a young and tender state, than when it is in a more adult; unless the mind has been improved before by exercise. Will any one undertake to prove, that the properties of matter improve, and the faculties of the mind always continue the same, contrary to universal experience. After death, when the body is no longer acted on by the living principle or soul, it is so far from being improved, that it is endued with no other principles than meer matter; and incapable, by any art known to mankind, of having any living principle given to it.

5. Perception, understanding, and will, &c. i. e. the living powers seem always to be situated in and are never found, except accompanying

nying a certain state of the brain, and consequently inhere in and belong to the brain; concomitancy is a proof of one being contained in the other.

2. In a swoon, or apparent drowning, we cannot reasonably suppose the soul to leave the body and return: in sleep the mind either imperfectly thinks, or not at all, probably owing to the powers of life still in the body.

Sensation and self-motion, in a more perfect state, often accompany a more healthful state of the body and its parts; but when some of them are injured to a considerable degree, the functions of the mind suffer also: all the parts of the body may be injured to a small degree, as appears to me, without any sensible injury of the faculties of the soul; but, when some of them, as the circulation of the blood and juices, the heart, the brain, &c. are destroyed or injured to a great degree; then perception, thought, &c. are no longer found or contained within the body.

1. If concomitancy in time alone is a proof of thought being contained in whatever accompanies it, then does thought inhere in and belong to the blood, the juices, the heart, the brain, &c.; from such concomitancy, what reason have we to give a preference to one of these more than another? all the works of the creation,

tion, that begin and end together, may, from a parity of reasoning, be said to inhere in and belong to each other.

2. But if by concomitancy is meant concomitancy in time and place: from our sensations it appears, that perception, understanding, will, &c. exist together somewhere within the brain; either in some part of it, or in some place contained between two or more different parts: let any one mention the part of the brain, in which the soul exists, or which is the soul; but if no one can, then no concomitancy in place can be proved: but if it exists in any part of the brain, for reasoning, let it be the pineal gland; and if in the pineal gland, in what particle does it exist? for the particles seem very little to differ from each other, unless in situation; and in situation as little as possible from the next adjacent ones; and consequently the soul on this hypothesis from the body: can any one think that the motion of the blood or any juices (which is a *sine quâ non*) acting on a particle of the pineal gland, &c. can give it understanding, will, or active powers? for active powers must originate from the substance itself, and are not subject to any mechanical or necessary powers. After death no one will think it deducible from reason or experience, that by the motion of blood or any fluid, or
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meer matter whatever, perception or understanding, &c. can be given to any part of the pineal gland; and if no such perception, &c. can be given from the same motions or actions after death, it seems probable, that from them none can be given before death: but if it be affirmed, that every part of the pineal or other gland has sensation, perception, &c. and that the perception results from the perception of several parts; can the several parts, situated in different places, have perception in their respective places, without perceiving, i. e. having any perception in them? is it not a contradiction in terms? but if on the contrary it be said, that the whole perceives, without perception being contained in any part; this seems contrary to universal experience, and requires a proof, and also repugnant to every known property of matter; for the properties of matter result from the action of every individual part conjoined, if that may be called action which implies necessity, as the gravity or weight of the whole body results from the weight of each of its parts conjoined.

Freedom of will can arise from no mechanism, for universal experience testifies, that meer matter and any organization or disposition of its parts is necessary, not voluntary, in all its properties; the same may be asserted of all the particles of matter contained in the body after death,

death, or separation of soul and body; and of all the particles of matter, which are constantly superadded to every part of the body, and constitute great part, if not the whole of the body during life. The mind produces self-motion of the body and all the investigation of truth, not from any organization of the parts, for no particle of matter can give motion to itself; but from the soul.

The mind is fatigued, wearied, &c.; but matter never. In sleep the circulation, &c. are carried on in a perfect state, but they do not produce sensation, &c.; if sensation, &c. arises from mere mechanism acting conformable to our experience, the same cause would always produce the same effect; i. e. when the motions, &c. of the body are the same, the sensations, &c. of the mind would be the same; and likewise every action of any external object, by means of the body, on the mind, would equally and constantly produce a sensation or perception, which is contrary to constant experience.

The body and mind may be considered as a machine, which consists of a number of different parts; the effect may be produced in or by the ultimate, in this case the mind; if in the machine some of the inferior parts are injured, the effects will probably be injured; but if the same be destroyed, the effects will probably cease;

cease; all these inferior parts may be destroyed without the ultimate being injured; and by the addition of another body or inferior parts, perhaps of superior mechanism to the parts destroyed, superior effects may be produced: this may be analogous to the body and soul, for after the destruction of the present body, a superior may be added, and the powers of the soul or mind may be increased; the body probably subjoined will be of different materials, form and construction or organization from the present body; for the parts formed for generation, and the breasts for the nutrition of the infant, the present material system of nutrition and circulation of the blood and juices; and the secretion of the glands, which will probably render the body by small obstructions occasioned by any errors or irregularities in diet, &c. liable to disorders, and produce the destruction of the machine; and even our hands and feet, and the whole muscular system, may not be necessary, and consequently the whole organization of the parts may be changed; and further, even the substance or matter, of which the body is composed, so liable to corruption, may be abolished or changed, it may have no power of gravitation, &c.; but to change the essential properties of a substance, according to human understanding, is to create a new one: this corruption

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must put on incorruption, this mortal must put on immortality; it is sown a natural body, it is raised a spiritual one.

Our Saviour's body never saw corruption, it probably rose the same as laid in the grave, and continued so as long as was necessary for the conviction of his disciples; but no doubt it was or will afterwards be changed into the most glorious, and probably not of the same construction as the former human body.

Concomitancy in a complicated machine proves only that the several concomitant parts are useful, or probably contribute to produce some effects of the machine; and not that the effects of the machine are contained in or produced by any individual part of the machine but the ultimate, which in the human body is the soul, existing somewhere within the brain; but can never be proved to be contained in any part of it; and if it could, it would not be a demonstrative argument that the soul is that part of the brain.

I shall recapitulate what has been said on this subject. We know nothing of the substrata or substances of bodies; we only know from experience their faculties and properties; when these are different and cannot by any different disposition of parts be rendered similar, we naturally conclude their substrata different; perhaps

haps the only conclusive proof known to us of the similarity of substances, is to prove their properties similar; if spirit or substance endued with perception be meer matter, the best proof would be so to dispose and organize meer matter, that it may acquire sensations, perceive and think, &c.; if a distinction is to be made between meer matter, which does not depend on their organization, i. e. different disposition of parts and organized matter, then meer matter cannot from human understanding be demonstrated to be organized matter: if all substances, which are not endued with perception, thought, self-motion, &c. be called material, then substances endued with perception, &c. may be called immaterial, i. e. not material, unless the former can be so disposed by us as to produce perception, thought, &c.: if the Supreme should give to any material substance the living powers, i. e. understanding, will, and self-motion, we should not, in our present state, know it to be a material substance, unless revealed to us. All the properties of matter, &c. are entirely passive, and consequently all their accidents in regard to themselves necessary; were it otherwise, matter must be an understanding substance, and endued with will, for no deeds can be said to be really actions, but what are voluntary: some of the powers of the mind are active and voluntary:

is it agreeable to experience, that things entirely passive, by any composition can become active? things without perception, understanding and will, and self-motion, can totally change their nature, become superior, and acquire the beforementioned faculties? No one can tell what latent faculties, given by the Supreme, may be contained in any substance; but the abovementioned seem opposite to all the known properties of matter, and contrary to universal experience, from which only we can reason.

From what has been said, it appears that the principal properties of matter and spirit known to us are widely different, and consequently no reasoning from them can ever prove their substances to be the same, but to our understanding must argue the contrary.

Concomitancy in time has been shewn to be no proof of identity of substances; and concomitancy in place of the soul and any part of the body can never be proved; and if it could, it would be no proof of its being that part, as some immaterial and material bodies may possibly be in the same place at the same time; though from experience it seems probable that two different material bodies, such as we are conversant with, cannot.

Concomitancy in the action of a machine does not prove the sameness of the parts, it does
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not prove the inferior parts to be the ultimate, and consequently the body to be the soul: when the lower parts are injured, the effect produced by the ultimate may suffer; all the parts of the human body are liable to some injuries; if the parts are not very greatly damaged, the faculties of the mind may not be injured in the least, and sometimes a slight injury of the body may be the cause of their improvement. The mind, as in sleep, often loses thought and will, or remits their intensity, though the state of the body in all appearance to us remains the same; if the mind depended entirely on the body, would not there always be a concomitancy? which indeed is most commonly not the case. In the same state of the body and external objects, would not the ideas in the mind be always the same, if they were owing to mechanism? does the understanding, &c. depend on the state of the body? the best understanding, &c. seldom accompanies the strongest or any one state of body. Our knowledge, and even the improvement of our faculties, depend principally on the cultivation of the mind, by application and attention; the properties of matter never improve or alter, the same circumstances being supposed: different minds are grieved with different affairs, not dependent on any necessity, but originating from the mind itself; and when they are much grieved, the body
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will be injured by it, even as the mind suffers by the body being injured. All the parts of the body are constantly receiving additions of particles of meer matter and losing others; if ideas, thoughts, &c. were essentially contained in those parts, it would be probable that every perception would remain of the parts retained and be eradicated of the parts lost; and if it depended on both together, there must be a change in the ideas, thoughts, &c. from the parts being added and lost; the parts added and lost constitute almost the whole of every part of the body; the particles of matter never weary, nor their actions cease, and consequently no composition of them: but I have been already too long on this subject; what the substrata either of matter or spirit are, or whether they are different or the same, must ever be unknown, and does not at all concern us; the something called Myself, whatever it may be, is of the same consequence; and its sensations, its happiness and misery, would probably be little affected by my being acquainted with its nature; and from it I could never argue concerning my existence in a future state: this most probably depends not on the substratum, but on the Almighty fiat, and his will can only be deduced from our moral not our natural faculties.

13. Whether our ideas are mediately produced in the mind by the action of external objects, or
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immediately by the Almighty fiat without the means of external objects, can never be demonstrated by the human understanding.

The following are some of the arguments, which have been adduced for the rejection of external objects.

1. We have no idea of such a substance: this argument would equally prove, that there is no substance or existence of any thing in nature but ideas, without any being or substance for them to exist in: a proposition contrary to common sense.

2. It may be granted, that nothing is like an idea but an idea, but we cannot thence conclude, by reason or experience, that nothing exists but ideas; on the contrary, general experience teaches us, that every thing, and consequently every idea, has a cause which produces it, and that the several ideas, which accompany each other in the same time and place, are derived from the same cause, or the same substratum: if from repeated observations we find the substance to be endued with perceptivity and self-motion, we denominate it a living being; if we perceive it to be endued with perceptivity, and to draw rational conclusions from several self-evident propositions immediately deducible from experience, we denominate it a rational being; if we perceive it to investigate and have a sense of the

the laws given by the Supreme for a rule of its actions, we call it a moral agent: and we generally conclude, that these living and rational beings have some substrata, in which their several attributes are contained: but does it not appear equally reasonable; or may not we reason from the analogy of all things, that what are termed material bodies, which always produce in our minds certain collections of ideas, and seem endued with properties for that end; for the support of our bodies; and improvement of our minds; and exercise of our moral faculties, by affording us the means of doing good to our fellow creatures and preservation of ourselves; and probably many other accounts; have equally substrata in which those properties exist?

3. Another argument is, that no substance can give another any property that it has not itself, and consequently no substance that is not possess of ideas can produce ideas in other substances, nor give any ideas which it has not itself: we may from the same argument conclude, that it is impossible for any body not endued with perception to exist; for by this reasoning, it can never be perceived by the Supreme or any other being: but this is evidently absurd; no doubt the Supreme can create substances not endued with perception, that can produce ideas in our minds; and the question is not what he can do, but what he has done. He

He has given one substance, viz. Man the power of producing ideas in another consentient to his own by the use of language, &c. he has further given him the power of producing ideas in others, which are not always contained in the mind of the producer at the same time; e. g. he has given to some the power of producing the ideas of pain, imperfection, &c. in others, from which they are exempt at that time; and on the other hand to inferior animals or substances a law by which they produce in superior ones ideas of which probably they are not possess. Persons reviewing the table before them, on which they write, believe, that the something, which gives them the idea, is not possess of it itself: experience therefore testifies, the supreme has not established a general law that nothing shall give or produce in any other substance or being, what it has not in itself; but the contrary appears through the whole constitution of nature.

4. It has further been argued, that such intervening objects would be of no use, as the almighty fiat could equally produce the effect without them, as by their assistance: to this it may be answered, that by this reasoning no substance whatever material or immaterial is of use, for the almighty could equally have produced every effect without as with their assistance:

ance: but it is too arrogant for human reason to assert, that any thing can be of no use, we know not all, perhaps very few of the uses, to which the bodies with which we are most acquainted even ourselves, much less substances of which we have no ideas, can be applied; an argument against the existence of things, because we are unacquainted with their uses, must ever be esteemed weak and presumptuous for the abovementioned reasons; we are not to argue concerning the best and properest modes of acting, for of that we cannot judge; but from experience to see the existence of things, often some of their uses; and of this be assured, that every thing existing has its use; and one of the uses of these substances is the production of ideas, &c. in our minds. Does not the existence of properties argue the existence of bodies, substances or substratums in which those properties exist? Has not the almighty given us a power of producing ideas in each other by means of intervening objects? Has he not made the air necessary for sounds, and light for colours? or are there no bodies, no substrata, no worlds, no creation of the Almighty, in opposition to the general sense of mankind, and consequently appearing as a deceit on that general sense? once more do ideas and properties exist without a subject or substratum

stratum to exist in, and is this deducible from or agreeable to the general and analogous experience and sense of mankind? and further if we should be allowed to reason from human nature, we should esteem it much more becoming the dignity of man to frame machines which should answer the end proposed by any other being, than constantly to attend and be obedient to the will of that being; this as to humanity: but as to the supreme I only argue from experience of what is done, which for reasons though unknown to me, is certainly the best, and by a little experience is ever found useful; but I do not pretend that weak arrogant man can prove it the best, his abilities do not extend so far, he must look to what is done, lay his hand on his mouth and be dumb.

5. Our knowledge cannot extend further than our ideas, and as far as our knowledge extends every substance appears to us only as a collection of ideas: we are ignorant of the substratum or constitution of every substance, and consequently can never deduce any properties beyond what experience teaches; nor can we from the properties so deduced extend our knowledge to the substratum, nor even one step higher, nor one step lower, and consequently only to properties contained in those deduced from experience; and since we know nothing of the substrata of bodies, we know

nothing of their identity, nor of the difference between the substratum of matter and spirit: of these the allwise or superior beings can only have knowledge.

6. We can only know our own personal identity by consciousness; other persons judge of it by the similitude of appearance as to the body, parts of the body, voice, &c.; or in some cases from the mentioning of different circumstances, which they remember formerly to have occurred, and could be known only to some particular person.

7. The identity of vegetables and other substances is known by being found in the same or known place, and their similarity at different times.

ON PROPOSITIONS.

Propositions are either independent, dependent or relative, or suppositive.

1. The probabilities of independent propositions are to be estimated from the laws of the probabilities of experience and testimony.

2. The probabilities of dependent and relative propositions are to be estimated from the same laws applied to the dependency or relation.

3. The probabilities of suppositive propositions are to be estimated from their possibility only, of which sort are many mathematical propositions, which must generally contain as many

many different independent quantities as there are independent suppositions or hypotheses.

4. If *A* has a given relation to *B*, then on the contrary *B* will have some relation to *A*.

5. In compound dependent or relative propositions we argue from the establishment or rejection, truth or falsehood of some propositions to the establishment or rejection, truth or falsehood of the other; and these are deducible from the same principles of experience and testimony.

6. One false step in a demonstration and all the remaining true will necessarily lead us into error:

7. One false step may be reversed by another, and from thence a true proposition inferred; but commonly two or more false steps will lead us further from the truth.

8. In demonstration we proceed carefully from one step to another, from the second to the third, and so on till we come from the first to the last, between which the relation is required.

9. In demonstrative or which is the same, knowledge deducible from other by the reasoning faculty; from no two propositions can a third be concluded, unless one of the propositions is, that one term is or is not contained in another.

10. If an attribute or property is asserted or denied in general of every individual thing contained

tained in a certain species, then it is asserted or denied of any particulars contained in that species.

11. If the same or part of the same thing *A* is predicated or denied of two different *B* and *C*; then something, which is predicated or denied of one, is likewise predicated or denied of the other; for *A* is predicated or denied of both.

12. When all or some of one species have such a property and all of another not; then all or some of the former species cannot be of the latter.

In these three last articles are contained all the categorical syllogisms.

13. If *A* is included in *B* and *B* in *C*, &c. then *A* is included in *C*, &c.

14. An even number of negative propositions following each other gives an affirmative conclusion, and an odd number a negative.

15. Propositions which reciprocate as equalities in mathematics are joined by similar copulæ: negative propositions always reciprocate when the terms are taken in general—in the reciprocal proposition the predicate should be made as particular as the subject in the original proposition.

A is said to be similarly predicated of *B* as *C* is of *D*, when *A* is joined by the same copulæ to *B*, as *C* is to *D*.

ON TESTIMONY.

1. The probability of any relation of facts depends on the probability of the fact and credibility of the relators, but varies not as the product of the one multiplied into the other; for this would render a fact related by truth and knowledge itself to be very improbable: the probability of such a relation varies principally as the credibility of the relator; for if two credible persons in London should assert that they were eye witnesses of a fact happening at Long Stanton at such an hour of such a day, though the chance of either of them not being at Long Stanton at that time, to the chance of his being there (before it is asserted) may be as ten thousand to one, and the chance of the events not happening at that time and place to its happening in as great a ratio, yet we do not hesitate to believe it, unless we knew some reason, that would or did prevent the persons from being there, or some præestablished law or custom or reason contradictory to the facts happening at that time.

2. Hence it follows that the improbability of a fact related in history or otherwise may be very great indeed before it is related; but, if related by persons of whose competent knowledge and credibility we have little reason to doubt, the probability may be such as to excite in us the greatest confidence of its truth, e. g. If a person

son mentioned that in such a family the mother, son, grandson and great grandson, each lived to 80 years of age; and if the relator was a person of whom we entertained a great opinion as to his knowledge and integrity, and he assured us that he had particularly examined into the truth of it, we should not hesitate one moment to believe it. If writers of undoubted authority, knowledge and veracity, assured us that seven kings reigned 210 years, a thing much less incredible than the former, we should not hesitate to believe it; the belief of this may be strengthened or weakened by correspondent facts, it may be strengthened by the kings being elected of a proper age, so as most likely to live the longest, &c. In all these cases we cannot argue from one man or ten men living to a certain age, to one or ten others living to the same, for it will most probably deceive us; but from a great number some probability may be collected—the same may be asserted concerning all variable facts. To invalidate the belief of such facts, the properest method is to demonstrate the incompetent knowledge and deficient integrity of the writer.

3. The improbability of these facts before they are attested, differs very little in degree from the improbability of a miracle; but a miracle being a particular interposition of providence, will never happen unless for the greatest and best

best and most benevolent purposes, principally for instructing mankind in the means of acquiring eternal happiness. This being necessary for people of all times will contain internal evidence, which will be consistent with and confirmed by all other laws given by divine Providence either by nature or revelation.

4. If the relator be the *Supreme*, i. e. Truth itself, the fact is certain; on the contrary, if the proposition be a contradictory one, it is assuredly false.

5. Many facts, of which no testimony or writing remains, sufficiently prove themselves: I shall only mention a matter, in which I had some concern: a person had the bite of a small coppice and kept the fence adjacent to every ones share of the timber growing on it; no testimony remained of the manner in which he and his ancestors became possess of it: a dispute arose concerning the property of the soil, but it may easily be settled from this observation, that no person whatever in his senses would give another man leave to plant trees for ever in his soil; he might as well give him the soil itself: and as to his having the benefit of the bite and keeping the fence of the other parts which were judged nearly equivalent, it must be supposed that he had the one for the other; as no one would put himself to the ex-

pence and trouble of keeping another persons property in which he is not concerned without receiving an equivalent ; this is a common case in many coppices.

6. The credibility of a witness depends on his supposed knowledge of the fact and integrity: his integrity must be judged of by what is known of his character through life ; it may be warped by interest, party, prejudice, passions, connection by blood, friendship, authority, habit, &c., and proper abatement to be made from the credibility on these considerations, and a proper addition for evidence given in contradiction to them ; it may be rendered more firm by reward and honour being annexed, dishonour and punishment to the failure of it, and a proportional subtraction or addition to be made: his knowledge may be estimated from an examination, and known circumstances, which either debilitate or corroborate his evidence: if a fact has been communicated from one to another, and so on ; before it came to the witness ; the greater the number, the less *cæteris paribus* is his knowledge to be depended on: particular modes of communication may strengthen, and others weaken it.

7. The truth of written testimony, history, &c. depends as before on the credibility of the facts

facts and on the knowledge and veracity of the writers; which must be judged of from the writings of cotemporary persons; and on the original manuscripts being lodged in secure places, where they probably neither could nor would be corrupted by any alteration or interpolation: and also on the probability of the several editions extending to the present time being truly copied from the original and each other, which most commonly depends on the number of readers and the supposed importance of the subject; these may be collected from the writings and prevailing customs of the different times.

8. The internal evidence depends on the agreement of the several parts, and also their consistency with our own reason and experience.

9. 1. From these premises it will follow, that the writings of the new Testament have much greater external evidence than any other of the same date.

Christianity was first published to the world by our Saviour Jesus Christ during the time of his divine mission for years going through the different towns and villages of the Jews, constantly preaching its doctrine and working miracles; he was always followed by his disciples and commonly by great multitudes of people who were witnesses to these miracles: christianity is

a religion, which contradicted the tenets, and forbad the practice of many things in all the religions of the world; a religion, which must appear of the greatest importance, as it proposed the means of salvation to all mankind; and denounced misery to all, who did not follow its precepts: it was not only afterwards promulgated by writings, which would be read in the closet by a few philosophers; but was published with the greatest zeal and activity through all the known parts of the world by those who professed themselves eye witnesses of all the facts they published, and worked miracles and suffered martyrdom in support of the doctrines they taught; multitudes being living, who were witnesses to several of them; and many on whom miracles had been wrought: this naturally excited every kind of opposition, cruelty, deprivation of property and life itself from the zealots; and different orders of men, who were gainers by the established religions; hence arose disputes and controversies, so that christianity has undergone more examinations, and many more writings have been published from the first institution to this day on it, than on any other subject; and it has so far prevailed as in general to have abolished the idolatry then prevalent and to have become the religion in all countries, where learning and reason are much culti-

cultivated: the books of the new Testament have a further additional evidence by having been constantly read at stated times in all churches and congregations of christians; whereas books, which contain nothing material to the instruction and happiness of mankind, are only read by the learned, and deemed of little consequence, whether true or false. The old manuscripts of the new Testament have been kept in the churches and public libraries, where any person might at proper times read or consult them, and all the different sects appeal to them; manuscripts kept in private studies can never have the same authority, as they may be corrupted by the possessors, and from hence very probably some different readings of the new Testament have occurred; the more ancient and the more publick the manuscripts have been kept, the greater is their authority.

The oldest manuscripts now existing extend nearly to the third or fourth century of the christian æra; copies of the original or translations into the latin or vernacular languages are in christian countries in the hands of most persons, who can read: fac similes are made of some of the old manuscripts, but they should be made of those of the greatest credibility, and pass through the accurate examination of several persons of character to stamp the

the mark of authority on them : collations of all the old manuscripts have been carefully instituted, which is the most secure method of preserving the different readings.

Another proof of the correctness of the several copies now remaining is, in consequence of the disputes between christian and heathen writers many passages from the scriptures were inserted in their writings, and from the earliest ages the quotations of the fathers, the first christian writers, are conformable to the present copies.

I have recapitulated the facts, and from them I conclude 1st. that no human method of publishing a doctrine could be devised superior, more diffusive, more subject to every examination and more satisfactory; no human means of acquiring knowledge and detecting imposture could be greater than the abovementioned of seeing and conversing many years with the founder of christianity and examining his works and doctrines; and 2dly. no greater proof of veracity and knowledge can be given, than the unanimous agreement of so many disinterested eye witnesses working miracles and dying in the support of the truth of their testimony: these facts of the disciples of Christ are related by more nearly cotemporary writers, and never denied, than any other whatever; and likewise
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confirmed by their being constantly delivered from that time to this in congregations assembled in many parts of the earth: 3dly. nor could any manuscripts be guarded with more security than those of the new Testament; they have been preserved in the most publick places, and copies of them in the hands of the generality of christians; who justly thinking them of the greatest consequence, would take care, that they should not be much corrupted, and would scrutinise every alteration: add to these an argument in support of christianity, which can never be adduced in support of any other fact or history having no relation to it; I mean the fulfilling of prophecies, which extends even to the present and future time; no other history or facts relative to it ever laid the least claim to preceding prophecies, prophecies of facts very improbable in themselves both as to time and place; and particularly so, when miraculous events are foretold, cannot be construed less than miraculous.

Hence amazing the difference between the external evidence for the truth of the new Testament and every other history: 1st. If we may judge from histories of our own times, several facts are related not perfectly consonant to the account given of them at the time, when they happened; this may arise from different causes.

causes. 1. If the person writes the history of himself and friends, it is to be fear'd, that he will be biaſſed to represent them in too favourable a light : but if he was not a party concerned and writes from the relation of others, the first relators may and often will represent things in a partial view, being connected with a party or biaſſed by interest ; or afraid of the power, influence and connections of others ; or having only hearsay authority never perfect ; or a distant memory very fallacious ; and not perfectly understanding matters, may make them accord to his own conjecture or inclination ; or from party be led to relate things somewhat different from the former representation : when historians guess at the causes of things, the odds are generally against them ; for caprice, humour, and many little accidents so intermix with all the actions of mankind, that at a considerable distance of time it is for the most part weak and vain to form conjectures of our own ; historians of the present times must know more of the circumstances attending than can ever after be recovered ; hence the emendations of critics will generally be false, for a great multitude of things, of which they are entirely ignorant, militate against their conjectures ; hence many causes of error, so that truth is commonly mixt with falsehood ; nor is there

there often any cause of much importance to counteract them, for no miracles can be expected to be adduced in favour of truth so immaterial, no corporal punishment for falsehood, no sufferings of death in support of the truth of the relation: indeed seldom any body will be found, who thinks it of so much consequence as either publickly to approve or contradict; little regard will ever be paid to the preserving the old manuscripts and carefully printing true copies of things of so little importance to the happiness of mankind. The immense difference between the evidence of the gospel and profane history indicates the direction of supreme wisdom, promulgating its laws to mankind.

In regard to the internal evidence of sacred story; what can be more elevated and just, than is given in it concerning the divine attributes, his power, his wisdom, his goodness, his justice? What can be more animated, than the spirit of devotion, which pervades the whole; of thankfulness for mercies and blessings received, our creation, preservation and all the blessings of this life, and above all for the pardon of our sins and redemption from God's wrath by *Jesus Christ*? Can any thing be more earnest than the prayers and petitions for the grace of God in this life and eternal happiness

in the next? What precept of morality can be more just and benevolent than to do to others as we would they should do to us? Can humility, charity, purity of manners; can temperance and moderation be more impressed on the mind of man; or the respective duties between husband and wife, parent and child, master and servant, and other relations be better and more decidedly stated?

2. On the other hand how ignorant and immoral is in general the mythology of the ancients? How far distant are the actions of their gods from power, wisdom and goodness? How weak and perhaps sinful for christians to introduce seriously such folly and probably impiety into their writings?

Their morality ignorant like their mythology before the coming of Christ, sometimes has an appearance of justice and temperance, and sometimes permits the very worst vices; generally wavers, and is never built on any solid foundation; so that christianity exceeds paganism in its internal, perhaps even more than in its external evidence.

3. Hence it appears, that it is not in man to invalidate the truth of christianity; nor ever can be till the end of time or a new revelation; and if a new revelation should ever be delivered, it is scarce possible to believe that in after times

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it should have superior evidence of its truth to the present: every rational person therefore will necessarily follow its precepts, not being able to invalidate the truth of it, and esteem it a great argument in support of its truth, that it is not possible to prove its falsehood; as he must believe that the *Supreme* would never suffer any falsehood of such infinite importance universally to exist without affording means of its detection; and further if such falsehood did exist, no one could justly be condemned for following it.

4. Before the promulgation of the gospel of Christ; the tenets of philosophers were built on a weak or rather no foundation, were often absurd and immoral, and shewed their utter incapability of ever finding and proving the necessary obligation of moral laws; conscious of it themselves some became desirous of a teacher sent from God to shew them the way to salvation; and if the obligation of the moral laws could not be proved by them, how much less the remission of sins, the sufferings of the Son of God a propitiation for them; things of the greatest importance, but not to be discovered by the utmost stretch of human sagacity? but let not the moralist of the present day triumph in his superiority, for were the memory of christianity entirely forgot all his boasted

arguments would hardly be sufficient to influence his own and much less the actions of all mankind.

5. No revealed religion except the Jewish and Christian pretends to a proof from miracles and prophecy; but any truth, not deducible from human reason, requires such proof for its support; and consequently no other revealed religion can be true, not having its necessary proof.

The miracles for the proof and attestation of the Jewish law were performed in the sight of the whole nation of the Jews, and of such sublimity, clearness and manifestation as not possibly to be mistaken; had it been a deception the whole Jewish nation must have joined in it for many years, and continued in it till this day.

The prophecies delivered in the Jewish dispensation were fulfilled in the Christian, the continuation, completion and perfection of the Jewish.

6. With such evidence it has been asked why did not the statesmen and philosophers embrace it; and why did it not become the universal religion?

To the first I answer, that if the same miracles were done in the present enlightened age, I am afraid that similar effects would follow: the statesmen ever afraid of innovation, which
seldom

feldom turns to their advantage, would use their endeavours to overthrow it; and the philosophers, having embraced tenets of their own, would not readily subscribe to others destroying their self importance, their pride of fame and knowledge, and acknowledging the folly of all they had before learned and taught, and the superiour excellence of the doctrine taught by fishermen; they would affect to despise and not examine; and if any did examine, it would be with a view to overturn it; perhaps a very few more candid than the rest would embrace it; but time and truth would at length prevail, this may be the power of divine providence confounding the wisdom of the world. In answer to the second question, why true religion and morality is not universally diffused; it is not in my power to judge of the dispensations of providence; I can only advance the fact, that true religion or any one religion is not universally diffused; this dispensation may result from the nature of things and state of trial, in which we are now conversant.

ON MIRACLES.

The Supreme has preestablished a system or course of nature, that several events shall always accompany or succeed each other; which laws being learnt from experience, no doubt is
ever

ever made of the continuance of them ; and if they ever fail, when all the circumstances are the same, it must be esteemed a miracle; that is an alteration or change in the laws of nature ordered by divine providence for some particular utility in the system, commonly a change in some particular instance of the natural system for an attestation of truths in the moral, of the greatest benefit to moral agents contained in the system to know: in this case the circumstances should be accurately examined, in order to its being clear that they are all the same and no collusion contained, i. e. they are apparently the same but not really; perhaps nothing can afford so strong a proof to us as the performing some very uncommon event contrary to the laws of nature by a word or command only, of this all mankind can pretty equally judge; but if any thing mechanical be done, which requires skill and time to examine, we shall fear collusion, it not being in the power of the generality to determine; the more simple and manifest the operation, the less shall we fear any.

The performance of a miracle argues the same power as creating something out of nothing; for by a word to command something contrary to the established law of nature is to abolish the law already given, and to create a
new

new one, i. e. to create something out of nothing, which contributes to it.

The more impartial and proper the witnesses, the greater support do they give to their testimony of miracles; simplicity and even ignorance often afford evidence more to be relied on than cunning and even superior knowledge.

Different miracles add support to each other. A miracle will never be performed for proof of a falsehood or for no utility, it being contrary to divine wisdom and goodness; but we must not arrogantly judge that a miracle is of no further use than we are sensible of; though we can argue no further than we know, yet it should ever be without concluding that there are no other uses, for we know not all the uses of any one thing.

If we cannot doubt of the truth of a miracle performed by a being, for a proof of any doctrine delivered by him, we cannot doubt of the truth of that doctrine; for no being can perform any thing without permission from the Supreme, and the God of truth would never grant such permission to prove falsehood.

Miracles and prophecies are not so necessary, if at all, in the present time, as before the delivery of the gospel. It was necessary before for the consolation of mankind, but the Messiah being come, and having suffered for the sins of mankind, and given satisfactory proofs of his mission

sion, and taught the means of salvation, all consolation necessary is afforded us in the gospel.

ON PROPHECY.

Miraculous prophecies must generally be delivered for the proof and support of a religion given for the good and salvation of mankind; or in some particular cases for the reformation of some persons or people.

The credibility of a prophecy is to be distinguished into four different periods; the time of the delivery of the prophecy, a time after the delivery and before the completion, at and after the completion of it.

The credibility in conjectural prophecy, i. e. conjecture at the time of its delivery depends on the probability of the thing prophesied; and in miraculous prophecy on the credibility of the prophet.

Every thing foretold that will probably happen in the common course of nature conformable to past experience is a conjecture, e. g. that the sun will rise on the morrow; that a person will die in such a time, which is according to the common course of nature; or that he will die in a shorter time, being a just prognostick from his disorder; or that one event will succeed another, being agreeable to past experience.

If

If the chance of the event's happening within the assigned limits of time and place be almost infinitely small, or if the event foretold be miraculous : the chance of such an event's happening before it is foretold, is all but certainty against it; and the credibility of it at the time of its delivery depends on the credibility of the prophet.

The credibility of the prophet may be rendered certainty by his performing an indisputable miracle; or his foretelling something almost infinitely improbable in support of his prophecy, which happened accordingly.

Miracles performed by him; or some improbable prophecies fulfilled; though not expressly on account of the prophecy delivered; render the credibility great, though not so great as if they had been given expressly for a proof of the event foretold.

The eminent piety and integrity of the prophet's life, and the prophecy being delivered for apparent good and wise purposes may contribute to our belief of it : in contradiction to the latter no credit can be given to prophecy; but the bad life of the prophet will greatly lessen, though perhaps not entirely abolish it; as the Supreme may for reasons unknown to us, deliver prophecies through the mouths of persons, who have been guilty of the most atrocious crimes.

2. The credibility of the prophecy between the time of its delivery and completion depends on the credibility before mentioned, and the probability of the prophecy's having been foretold.

3. At the time of completion, the event having certainly happened, we are to enquire into the probability of its having been foretold; this depends on the evidence of former writings, &c: but if a miracle was foretold, the improbability of its happening even the hour before it did, may be equal to that at the time of the prophecy; and consequently it will then be easy to prove whether it was foretold or not. The prophecies concerning Christ were made successively from the creation to about 300 years before his appearance; his birth and character were such as no human genius could even in thought devise unless by inspiration, and much less could have probably happened according to the common course of nature: What is contained in the writings of the Heathens that has the least analogy to it?—A God with us, a prophet, a king, a priest, the Lord of hosts and glory. A son, wonderful; counsellor, the mighty God, the everlasting father, the prince of peace; of his government and peace there shall be no end; the spirit of the Lord shall rest on him, the spirit of counsel and might, the spirit of know-
ledge

ledge and of the fear of the Lord; with righteousness shall he judge the world and the people with equity; to him (the seed of Jesse) shall the Gentiles seek, and his rest shall be glorious; the Lord and thy redeemer the holy one of Israel; a light to the Gentiles; his own arm brought salvation to him; the Lord our righteousness shall execute judgment and justice in the earth; the spirit of the Lord God is upon me, because the Lord hath anointed me to preach good tidings unto the meek, to bind up the broken hearted, to proclaim liberty to the captives, and the opening of the prison to them that are bound.

—He gave his back to the smiters and his cheek to them that plucked off the hair; he hath no form, nor comeliness, no beauty that we should desire him; he is despised and rejected of men, a man of sorrows and acquainted with grief; he hath born our griefs and carried our sorrows; he was wounded for our transgressions and bruised for our iniquities; the chastisement of our peace was upon him, and with his stripes we are healed; the Lord hath laid on him the iniquity of us all; he was oppressed and afflicted yet opened not his mouth; he is brought as a lamb to the slaughter, and as a sheep before her shearers is dumb, so he opened not his mouth; he was taken from prison and from judgment, and who shall declare his generation, for he

was cut off out of the land of the living ; for the transgression of my people was he stricken ; he made his grave with the wicked, and with the rich in his death ; because he had done no violence, neither was deceit in his mouth, his soul was made an offering for sin ; he poured out his soul unto death.—On the one hand possessing all power of healing, of commanding the elements, of every thing in heaven and earth ; on the other hand being subject to all human infirmities and sufferings, and even the most ignominious and painful death on the cross. Natures so apparently inconsistent and contrary to universal experience, that the probability against such being contained in the same person is almost infinite ; and never did nor ever will happen again to the end of time. These prophecies were defended and kept by the nation of the Jews, from their first delivery to their completion ; and no doubt even by the greatest enemies of christianity ever was entertained of the truth of their being delivered before the coming of Christ.

4. The credibility after the fulfilling of the prophecy is as the probability of the event's having happened and its being foretold.

5. If there are more prophecies than one, then the probability of the whole is to be estimated from the rules before given.

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1. The meaning of any passages of the scriptures must be deduced as of other writings from the sense and meaning of the words and sentences which compose them.

2. If a truth taught or delivered in the scripture be not comprehended by the mind; then the reader can only say that there is some proposition delivered in it, of which he has no comprehension; but whatever it may be, he believes it to be true from the undoubted authority that delivered it.

3. If the mind comprehends its meaning, but the deduction is above the force of human reason; then it must be construed in the literal sense of the words; and if several passages occur on the same subject, they are all to be taken in the literal sense; but if any two taken in the general sense contradict each other, they cannot both be true in the general sense, but must be restrained to a particular one, in which both agree; and this may be rendered more probable by the same terms being used to express the particular relation not to be misunderstood.

4. Hypotheses not expressly contained in the scriptures, but framed to solve difficulties will generally be false, and can be of no authority; for the proof of any thing above human reason requires miracles, and the conception of it divine

vine inspiration: in such proofs human authority can never be relied on, it may be sufficient for a proof of facts, but not of doctrines superior to human understanding: doctrines necessary to salvation will never be delivered without a sufficient proof; nor will they be delivered in terms not intelligible; but if they were, then their explanation would require the same proof as the doctrines themselves: search therefore no further than the scriptures for the explanation of any thing above human reason contained in them.

If the doctrines do not regard our salvation, it is comparatively immaterial whether they are true or not.

5. The meaning of words or idioms deduced from correspondent or other passages of the same book, or writer, or cotemporary and connected writings is much more probable than the meaning deduced from the writings of others; and particularly on divine subjects.

6. To examine controversial points; write down all the passages contained in the scripture on the subject, and construe the meaning of every word in some passages the same as it evidently is in others, and make them all agree without framing any Hypothesis; thence probably will be deduced their literal meanings.

7. But if after all this examination there should

should be passages contained exceeding human reason, which are not sufficiently explicit or have two different meanings; or different passages which imply different senses, every word being rendered according to its meaning contained in other passages of the scriptures: then the meaning of such passages can never be ascertained with certainty; and some readers will explain them in one meaning, and some in another; but let them differ from each other with humility and candour; and be assured of this, that if the meaning of them had been necessary to salvation, the *All-good* would have delivered them in terms more explicit, so as not to be misunderstood by any one who sought it with diligence and a proper temper of mind; but I do not assert nor believe that any material passages of this kind are contained in the scriptures; nor any contradictory ones, as the same thing exists and does not exist, the same person or being is indued with a faculty and not indued with it at the same time; such propositions contrary to human reason and experience would appear to create a variance between revelation and reason.

The authority of the different readings must be collected from that of the manuscripts which contain them; any reading not contained in most of the old manuscripts must be deemed doubtful

doubtful if not rejected, and should be printed in translations accordingly.

Substances are often put in figure for others on account of some similitudes perhaps more striking, actions, signs or remembrances; but it is never meant that the substances are in reality the same as those for which they are put: can we in any case construe two different substances, one taken in remembrance of the other, to be the same; contrary to all other images or figures contained in the scripture, and contrary to the universal truth of nature contained in the creation? And if the fact was true, it would probably be a truth of little consequence; as the intent for which it was done would be the same, and the goodness of the action would be according to the intent.

If one substance is substituted in remembrance of another, the latter will always by every remembrance be brought into or received in the mind.

ON MORALITY.

The principles of morality have been given different by different persons: I shall only mention those, which were taught by me nearly thirty years ago.

1. Morality is the law, which the Supreme has given to regulate our actions, and which is to be deduced from the light of nature. We can
only

only argue from what is done by the Supreme in the constitution of the universe, to our duty; that is, what we ought to do.

2. By the Supreme we were created, and preserved; from him alone we received the various blessings of this life, and from no other being do we either expect preservation in this life, or happiness or misery in the next.

From hence follows the first law of morality; viz. our creation, past preservation and all the blessings received in this life, require our humble and heartfelt thanks and gratitude of mind; and our expectations of future happiness or misery from the Almighty demand our constant intercessions with him, by reverence to his name, by prayers, thanksgivings and petitions with the most fervent devotion of every function of the soul.

3. He has given us our lives and instilled into us a desire of preserving them; we must therefore reason, that he never intended for us to destroy what he gave, to undo what he has done; but to preserve them, which can only be done by keeping ourselves in health by moderation in food, exercise, &c: he has given us reason and understanding or the power of acquiring knowledge sufficient to our purposes in this life, it cannot be supposed but that he wills us to improve it in things useful to our

well being here, and happiness hereafter; and also forbids us to destroy it equally with our lives by our intemperance, which debilitates our faculties, and further takes away the means of supporting ourselves by labour or genius.

4. The Supreme has given to all men equally their lives and the means of providing food for their support by labour; cloaths and fire for keeping the body in proper warmth; and medicines in some cases to restore their health; whoever therefore injures another person's body, or robs him of his food or deprives him of the means of acquiring it, &c. without the other person's, by infringing a moral law having before given a sufficient reason, unless perhaps in some cases of necessity; acts contrary to the will and mode of acting of his maker: in conformity to his example, he should by his opulence, attention and labour, contribute to alleviate the distress of the sick, and incapacitated to procure a sufficient and in some degree convenient sustenance for themselves and families.

I now proceed to principles founded on the preceding, from which may be deduced more generally the moral laws.

5. It appears from what has been before said, and from the universal constitution of nature; that the Almighty wills the happiness of

of mankind as far as is consistent with the state in which he has placed them: are not the means given of supplying ourselves with food &c. for the support and nourishment and well being of the body, and endowing ourselves with knowledge sufficient for the entertainment and instruction of the mind? and the very means are such as will generally contribute to our health and happiness: but he that gives us every thing that contributes to our support, happiness and well being, must will our good; and no one ever can doubt, that it is our duty to act in conformity to his will: the law given, or duty of one man must in the same circumstances be the same as the duty of another, for human understanding can discover no reason for a difference; therefore it is the duty of every man to act in such a manner, that if all acted in the same, would have the greatest tendency to produce the happiness and well being and good of mankind here and hereafter.

From this method of reasoning may be deduced the moral laws in a state of nature; all the commandments except the fourth, (namely the keeping holy the seventh day, a law clearly expedient when given, but not deducible from human understanding. Is it not expedient that some time should be allotted to teach men
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their duty necessary for their present and eternal happiness; to pay their devotions to that being from whom they have received, and on whom they depend for every thing, and for various other reasons?) general, benevolence being the principle itself and some other precepts of the gospel.

6. No man can see the ultimate consequences of things, the punishment annexed to any crimes, nor the rewards to pious and benevolent actions from the light of nature; though without doubt rewards and punishments are annexed to them, conformable to every system and all our ideas of legislation; and yet before christianity appeared and even at present much the greater part of mankind are directed by no better light, dim and obscure as it is; but no man can assign reasons, why the Supreme has made different or such orders of men, and why he has given to one superior knowledge or power than to another.

7. The most pure, the most enlightened religion has by artful and designing villains been rendered an engine for their ambitious, self-interested and cruel projects; but this does not invalidate the truth of the religion, which gives no precepts of any such tendency.

8. In a state of society the laws must consist of proper restraints and punishments, which
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are not contrary to the law of nature, inflicted on its members to prevent their acting contrary to their duty, and proper and lawful encouragements and engagements for promoting the good and happiness of the whole: they must be calculated on the whole with a design of producing the greatest happiness.

9. No one has any claim to future happiness from any merits of his own; every person is conscious, that he has already received a greater reward than his deserts have pretence to; and if we have done our whole duty, though the truth of every one is far the contrary, we are unprofitable servants: we can therefore have no claim, no expectation of any reward from the justice of the Supreme; we must fly to his goodness, and the promises which he has vouchsafed to make in the constitution of the universe and by revelation.

10. As we know nothing concerning the frame and constitution of man, we cannot from thence deduce any thing concerning his existence in a future state.

But has the Almighty made this world and all the things contained and even man the only being in it, endued with reason and moral endowments to perish everlastingly? Does it not seem more agreeable to human understanding, that the All-wise never created a
world

world and all things in it, with a determination to destroy the whole again? But, I may say with Job, I uttered things that I understood not, things too wonderful for me.

11. Is it not probable, that he has placed us in a state of trial in this world as a preparation for a future? Let us frame to ourselves the picture which our weak understanding seems to afford of such a state; and examine how far the state in which man is situated, may appear to agree with it.

The first principle that occurs in such a state will be the power of doing good or evil according to the will of the being placed in it.

The 2d. principle is, that probably there will be temptations from within himself and without to evil arising from some present pleasure or gratification; and his duty consists in resisting the temptations; and constantly adhering with zeal and alacrity to the laws: the greater the temptations the greater the merit of resistance.

In such a state laws must be supposed given either 1. positive from the legislator himself, or 2. to be deduced from the relative state and connections of things in which he is versant.

In the 2d. supposition general laws must be established; for how could the person discover the

the laws, and consequently be accountable; if he knew not the consequences of his actions.

If the punishment denounced immediately follows the transgression of the positive law, as was the case of Adam in Paradise, no one can thence argue the existence of any future state; for our reasoning can only be founded on the promises received, which were annulled by the transgression.

In this case the person must be supposed to have arrived at the state of maturity, before the law was given.

But the persons in the first stage of their trial may be supposed to have acquired no knowledge, not even of their duty; a wise and benevolent lawgiver and governor will appoint persons for their instructors, and none seem better calculated than those who have been and are in the like state themselves, and consequently are capable of instructing both from precept and experience, both in body and mind; it also appears to be the dictates of wisdom, that the tutor and guardian should have the ties both of duty and affection; of affection because the world may be supposed to consist of good and bad persons, and in bad persons the bond of duty may not be sufficient; and the performance of his duty should be repaid by the future gratitude and good offices of his pupil,

pupil, and also as well as of every other duty by the consciousness of doing right and inward satisfaction; the neglect of it should be punished by the behaviour of his pupil, and by the disquietude of mind it should occasion.

A wise and good governor would not immediately destroy a being in such a state of trial on the first disobedience of his laws, he would kindly warn him of his danger and check or punish him by remorse of conscience, pain, disease and misery; if he still proceeds in the breach of his commands, his punishment would increase; but if he becomes incorrigible, his body the instrument of all his actions would be dissolved, and his trial end: happy would it be for any person, if his remorse led him to attrition and repentance; for without repentance and amendment, no grounds of forgiveness can from reason be supposed; but though forgiveness may be obtained, yet it may be highly proper for example to others, that some punishment for the vileness of his former crimes should be inflicted during his existence in the present state.

But on the other hand the person who resists temptations and follows the direction of the laws, would for a reward find the resistance more easy, the lapses into vice less dangerous; and his virtuous inclinations and habits become stronger;

stronger; but sometimes natural evils would happen to a good person from different causes for the greater exercise of his virtuous inclinations: and when the trial is nearly over the body would decay and then die, and he depart to judgement with his virtuous or vicious inclinations acquired:

The bodies of all should not decay and die at the same period, for in the first stage it would be productive of many evils by acquiring bad habits not afterwards to be remedied; nor do predeterminate events of this kind appear very consistent with a state of trial.

When the infant arrives at the state of maturity, he would be rewarded or punished according to the regard which he has paid to his tutor's principles; he would find any strong habits acquired whether good or bad, to be eradicated with difficulty.

Such is the state of trial, which may be deduced from our reason and experience; but such is the state of man: may we not therefore conclude, that man in this world is in a state of trial for the next? certainly this is no state of continuance for him: the dealings of the Supreme with us in this world are the same as of a wise, good, and merciful governor with his dependents in a state of trial; their removal from hence will probably be to a state of certainty

tainty no more liable to fall, as a reward for their conduct in this state.

12. Hence arises a solution of the moral and natural evil visible in this world.

Moral evil is the consequence and proof of a state of trial; and natural evil will always follow moral evil as a denunciation of the evil, and a check and admonition to forsake it; and further as an exercise to the good, to shew their dependence on and resignation to their creator.

13. Does any good and wise prince ever promulgate a law amongst his subjects with denunciations of punishments and promises of rewards, when in reality no such is intended to be put in execution by him? and will the God of truth who cannot lie, from whom nothing can proceed but truth—instill or even suffer the belief of moral government, of a future state of rewards and punishments to enter the minds of any man, much more of all mankind, if no such state will ever exist? will he instill gratitude and other moral affections into our minds, if he never intends us to act from them? But if the light of nature was ten thousand times weaker (I believe it certain) than it is, it would be our interest to act from it when finite is opposed to infinite, mortality to immortality: I have given the principles of morality both from its being instilled in the
mind

mind and the moral constitution of the universe. Above all I must subjoin that life and immortality have been brought to light by the gospel.

PRINCIPLES OF NATURAL PHILOSOPHY.

The independent principles or laws of matter, from which by the assistance of mathematics may be deduced the propositions generally given in the four branches of philosophy.

1. Bodies or weights are found to be in equilibrium with each other, when the bodies or weights multiplied into their opposite velocities finite or nascent are equal, i. e. the opposite motions or weights are equal.

2. The action or attraction of one body on another is equal and contrary to the reaction and reattraction of the latter on the former: i. e. the quantity of motion or weight lost by the one, is equal to the quantity of motion or weight gained by the other in the same direction.

3. Bodies void of elasticity directly striking each other, never separate after the stroke.

4. The quantity of motion gained or lost by the stroke of elastick bodies in consequence of their elasticity is in proportion to the degree of elasticity; if the bodies are perfectly elastick, then it will be equal to the motion gained or lost by unelastick bodies.

5. Every body continues in its own state of motion or rest, unless compelled by some external force to change that state; from the force and its direction is estimated the change of motion and its direction.

6. Every particle of one body acts on every particle of another, according to some law whether simple or compound, of the distances from each other; which at the surface of the earth has been found uniform and in parallel directions; and at any considerable distance to vary nearly in the inverse ratio of the squares of the distances, at the least distances Mr. Boscowitz conjectures the action to be infinitely repulsive.

7. The compressing force of the particles of the air varies as the density.

8. In uniform fluids, the pressure is as the height and density of the fluid into the part pressed—the pressure is equal in every direction.

9. The velocity of a fluid running out of a small hole at the bottom of a vessel is found to be equal to that of a body acquired by falling from half the height of the fluid.

10. In capillary tubes the quantity of water suspended above the level is found to vary nearly as the diameter of the tube.

11. The resistance of bodies moving in fluids; which arise from the tenacity, friction, and matter

matter to be removed; are said to be nearly uniform, as the velocity, and square of the velocity.

12. Heat has been measured by the cooling of an heated body; for if the times are assumed in an arithmetical, the degrees of heat are supposed to vary in a geometrical progression.

13. The sine of incidence is to the sine of refraction in a given ratio, and equal to the sine of reflection, of light passing out of one medium into another. In light of different colours and different mediums, the ratio is different.

14. The apparent magnitude or visible idea of an object is said to be greater or less, as the picture on the retina from its last image is greater or less; the brightness of it to vary as the quantity of light spread on a given space of the retina, or more generally as the quantity of light directly and space over which it is spread inversely; and the distinctness to be more or less, as the light coming from one point of the object is more or less intermixt with rays coming from different points.

15. The apparent magnitudes of the diameters of the heavenly bodies and their distances from each other, vary as the angles, that the diameters and distances subtend at the eye.

16. The particles of bodies (as appears to me) if they are acted on and cohere together only

only by attractive and repulsive powers, must be situated at distances from each other, which neither attract nor repel, i. e. intermediate between a sphere of attraction and repulsion; for if they were situated in a sphere of attraction the particles would be made to approach, and if in a sphere of repulsion to recede from each other.

17. Since heat rarefies all bodies, and cold condenses; if the force on the particles from heat and cold was known, and the attraction of the particles is not affected by heat and cold; then the attraction of the particles at different distances would be known.

If atoms floating in the universe were endued with attractive and repulsive powers, as are found to belong to the particles of all matter; they would continually move, till they were accumulated together into one uniform mass, of which the atoms or particles would be situated at such distances from each other as to be between the spheres of attraction and repulsion.

These principles first given by Archimedes, Pappus, Huygens, Wallis, Wren, Galileo, Torricelli, Kepler, Snellius, Grimaldi, Newton, &c. have been applied with the aid of mathematical calculus and composition and resolution of forces by Archimedes, &c. to discover the equilibrium and specific gravity of bodies; by Galileo, who was the first I believe that applied the

the composition and resolution of forces to discover the law of bodies falling near the surface of the earth, either perpendicular to the horizon or projected on inclined planes; to construct a refracting telescope; other refractors have since been invented, and particularly one on a new principle by Mr. Dolland; by Archimedes, Pappus, Wallis and Huygens, to find the center of gravity; by Huygens to find the center of oscillation, explain the motion and law of pendulums vibrating in cycloids, the coronæ round the sun, the parhelia and paraselenæ; by Des Cartes for the solution of the rainbow; by Halley to discover the densities of the air at different distances; by Newton to calculate the forces of the planets tending towards the sun; and the lunar inequalities; and also to discover the imperfection of telescopes; and by Gregory and Newton to construct a reflector: various additions have been made to these, and a great variety of other problems on different subjects added by several persons; hence it appears, that a great number of problems may be added from a few principles subject to mathematical calculus, and every person who discovers such a principle greatly promotes philosophical knowledge.

18. The laws, which many phenomena observe, are unknown to us; they are subject to no calculus, unless greater or less, e. g.

The

The law, by which bodies are evaporated, dissolved and rarefied by heat; and condensed, and grow hard, by cold; the laws of hardness, softness, friction, magnetism, electricity, moisture, acidity, &c; and of many mechanical operations; the laws by which the particles of fluids move amongst each other, and the small particles of bodies adhere together.

Heat generally promotes the dissolution of bodies or fluids in their menstrua, but it has not been subjected to calculus.

19. An hypothesis has been framed, that nothing can act in the place in which it is not situated; and consequently no body can act on another at a distance from it, unless by means of intervening bodies or fluids.

The Almighty can give powers to bodies to act at distances on each other, either by intervening objects or otherwise; what he has done, as before said, can only be known from examining and finding their existence or not in nature: two things are necessary for a proof of such fluids; 1st. A proof that such fluids do really exist, which can only be deduced from our senses; and 2d. on the supposition of the existence of such fluids that they would solve the phenomena.

20. Is there an electrical, magnetical, nervous, and common attractive fluid for every menstruum?

If

If there be only one fluid, do the different effects produced at the same distances depend on the difference of the substances on which they act, or on their different disposition of parts? but if more than one, a difficulty to our common conception of fluids would occur to be explained, in what manner the different fluids or particles even of the same fluid should move amongst each other, so as not to give the least disturbance; but the effects should be the same as if no such motion had taken place.

The different principles contained in nature may be infinite for any thing that we know to the contrary.

PRINCIPLES OF MATHEMATICS.

The principles on which mathematicians erect their structure are few, viz: the axioms of Euclid. as 1. Two things which are equal to a third are equal to each other. 2. Add or subtract equals to or from equals or unequals, the sums or remainders will likewise be equals or unequals. 3. Things which mutually agree, i. e. coincide, are equal. 4. Two right lines do not contain a space. 5. If a right line falls on two right lines and makes the inward angles less than two right ones, the two right lines will meet on that side where the angles are less than two right ones; to which add 6. If we know

~~no~~ reason for the contingency of one event in preference to another, we conclude the probability of the former event's happening, as far as our knowledge extends, to be equal to that of the latter. 7. Future things will be analogous to past; e. g. if one person out of forty in past times died at the age of forty six, it is assumed as an hypothesis, that one out of every forty for the future will die at that age. 8. If the whole space consists of certain parts, then it is concluded that every space which consists of the abovementioned parts will have the same whole: but this may be collected from article 2.

From these, and perhaps a few other principles, I have seen about 2000, which may be deemed, independent propositions; I speak from conjecture not enumeration. I have myself wrote on most subjects in pure mathematics, and in these books inserted nearly all the inventions of the moderns with which I was acquainted.

In my prefaces I have given an history of the inventions of the different writers, and ascribed them to their respective authors; and likewise some account of my own. To every one of these sciences I have been able to make some additions, and in the whole, if I am not mistaken in enumerating them, somewhere between three
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and four hundred new propositions of one kind or other, considerably more than have been given by any English writer; and in novelty and difficulty not inferior; I wish I could subjoin in utility: many more might have been added, but I never could hear of any reader in England out of Cambridge, who took the pains to read and understand what I have written. But I must congratulate myself that D'Alembert, Euler and Le Grange, three of the greatest men in pure mathematics of this or any other age, have since published and demonstrated some of the propositions contained in my *Medit. Algeb.*, or *Miscell. Analyt.* the only book of mine they could have seen at that time, and D'Alembert and Le Grange mention it as a book full of excellent and interesting discoveries in Algebra; some other mathematicians have inserted some of them in their publications. The reader will excuse my saying so much, there being some particular reasons which influenced me.

In these enumerations I never include examples containing questions, which, when properly translated into algebraical language, become only particulars or applications or usual constructions of known propositions.

In pure mathematics the moderns have added several new sciences, as I may term them, which

were unknown to the ancients, besides very many propositions of a similar nature to their own.

1. Arithmetic and algebra in commerce of life, by far the most useful of all inventions.
2. The doctrine of chances and annuities.
3. Logarithms.
4. The rule of false: viz. having found near approximations to the quantities sought, i. e. to the solution of the problem required; and from thence finding how far the results from these quantities would differ from the given ones, by simple proportion they found more near approximations. The convergency of the more near approximations depends on the first approximations being much more near to one value or solution of the problem than to any other.

If any one quantity has two or more values nearly equal, than we must recur to a quadratic, &c. equation. Vid. Medit. Analyt.

5. Methods of interpolations, correspondent values, &c. from the preceding principles extended; and others added: vid. Medit. Analyt.

6. Summation of series, i. e. from the sum or integral express by a function of the distance from the first term of a series are deduced the successive parts, and vice versa, every quantity which is constituted of those parts must have

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the same sum or integral: the same principles have been extended to equalities.

7. Properties of conic sections and algebraic curves and solids, &c. deducible from the principles of algebra.

8. Infinite series: e. g. let a quantity denoting the ordinate, be an algebraic function of the abscissa x , by the common methods of division and extraction of roots, reduce it into an infinite series ascending or descending according to the dimensions of x , and then find the integral of each of the resulting terms.

9. It has since been discovered, when the resulting series is such as will converge, what is the degree of their convergency, and the interpolations necessary to render them converging: and the same principles have been applied to algebraic, fluxional, incremental and other quantities and equations.

10. The first principles of a method of deductions and reductions, which may be extended to geometry as well as algebra.

It is probable that in future ages new sciences even in mathematics, and, à fortiori, in natural philosophy, will arise; our knowledge in mathematics is at present, and perhaps ever will be, too weak for the application wanted in many cases of natural philosophy.

Euclid is the only book of the ancient mathematica-

thematicians read in lectures—Nor do we recur to the ancients before the time of Christ in the studies of Natural Philosophy, Natural History, Physiology, Anatomy, Chemistry, Physick, Botany, Morality, Agriculture, the various arts and manufactures, &c.; they were in all these greatly deficient, but the same will probably be the state of our knowledge in respect to our successors; may their increase of knowledge tend to render their piety, their benevolence, and every virtue superior!

ON THE FACULTIES OF VEGETABLES
AND ANIMALS.

1. Vegetables and animals differ in their properties from fossils, first by being endued with life producing sensible increase and alteration: 2dly. with faculties proper for fructification, for the propagation of their own species: no tree or vegetable can by art, be produced from vegetables of different kinds to themselves; the farina of the one cannot impregnate the pistillum of another quite different from itself, so as to generate a new species; if this were commonly the case, we should constantly see new species of plants, as the air contains innumerable different kinds of farinae; and we could not be sure of the species which would be produced from any seed: similarly, no new species

species of animals to continue can be produced. Nothing concerning the generative and assimilating principles of fossils has ever been discovered: 3dly. by being endued with various organs and vessels necessary to their several functions, viz. great part of the egg or seed necessary to ~~its~~^{their} nourishment in the embryo state; afterwards the root or mouth for the reception of the food; the leaves or lungs for inspiration and respiration; various vessels in the œconomy, viz: fibres and tubes for absorption and evacuation; &c. 4thly with irritability, which preserves the parts of fructification from noxious applications and an injurious temperature of the air; in animals this is greatly connected with sensibility; by the irritation of one part, convulsive motions are often produced in the other: this irritability remains in several parts of the body some time after the destruction of the vital principal particularly in cold animals, if their death be not gradual.

2. Our knowledge of plants principally consists in distinguishing one species from another, by their shape, size and colour, the figure of their leaves and parts of fructification; in knowing some of their uses to animals as food or physick, &c. or somewhat of the cultivation necessary to their life and increase.

3. The

3. The faculties of animals differ from those of vegetables, 1st. in sensation, reflection, feeling, and memory; 2dly. in volition and locomotive powers: 3dly. in instinct, which supplies the place of the understanding; the greater the understanding the less the instinct; it commonly directs animals in the choice of their food, particularly by their smell, in the nurture and care of their young; in their preservation from injuries, and in things necessary to their well being; and in the actions of the soul on the body; but in many of these the understanding changes and controuls the direction and inclination of instinct. Instinct ends where reason and knowledge begin; and continues no longer than requisite for use. All instincts must be deem'd superior to human comprehension and consequently as wonderful as the greatest miracle: brutes are endued with natural passions and feelings in some degree similar to men. 4thly. In natural language, brutes associate ideas as they occur from nature in instinct and accidents, by which they inform their young and others of the same species of the place in which they are situated, and also where food is to be found, and likewise forewarn each other of danger; birds often sing for their own pleasure and amusement, and the male for the pleasure of the female; some may
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be taught to repeat distinctly almost any word. Fishes have not the organs of voice, not living in an elastic fluid proper for the conveyance of sound, and probably not the sense of hearing.

4. The soul feels or receives sensations mediately or immediately from, and on the contrary acts voluntarily or necessarily on, every part of the body; for if any part be inflamed, it will create painful sensations in the mind: in the common healthful state of the parts it receives no sensation from them: the soul may act voluntarily on the voluntary muscles, or on those partly voluntary and partly necessary: it acts necessarily on every part, for if the soul be grieved or suffer from any cause, the involuntary motions, the secretions and circulations will be affected: it may be said to excite all the various motions necessary to it's life and well being.

5. The faculties of man differ from those of brutes. 1st. In having a power of enlarging or abstracting his ideas, by which he renders them proper objects for language, and in improving and exalting all his living powers: his perceptions, motions, forces, &c. are improved by the invention of instruments calculated for their respective purposes and use; and his understanding and will corrected and exalted

each

each by its proper exercise and both by their mutual assistance: 2dly. In reasoning, for brutes reason immediately from the past to the future; but seldom or never use intermediate steps: 3dly. In their moral faculties, for brutes have no knowledge of the Supreme, deducible only by the reasoning faculty; and consequently perform no action because it is agreeable to his commands.

These principles of mechanism, vegetation and animation are not deducible from each other; but from the will of the Supreme.

ON THE IMPROVEMENT OF THE FACULTIES OF MAN.

I. The child having acquired the language of his own country from his parents, nurse and others, generally proceeds to learn its alphabet; spelling and reading from the New Testament, as containing the doctrines of the christian religion, and from books of short entertaining stories useful and moral; he is further taught to repeat, at stated times, short prayers and pious ejaculations, which the mind generally retains through life; this is followed by learning writing and arithmetic, as far as is necessary to the keeping of all useful accounts; at this time, or sooner, he begins to learn the rudiments of other languages, if necessary:

cessary: in learning other languages he must first learn the alphabets as correspondent to his own; then the grammars, which always contain the idiom of the language, and lastly the language itself from the books contained in it.

2. The reading of books in one language will little assist the learning to spell or write in another; as the learning of hebrew to spell in the greek, of the greek in the latin, and of the latin in the English.

3. The translation of passages from one language into another will render us more perfect and clear in the latter language, and more intelligent in the relation between the languages and their idioms.

4. The learner should accustom himself to write down the material passages, or an epitome of what he reads; from whence he will acquire a greater facility of retaining the most material passages of what he reads and hears.

I have only mentioned the common methods of study used in all schools, for probably none preferable can be devised.

5. The further course of study to be pursued must principally depend on the business the person is intended for in future life.

1. If the profession intended be divinity, he should apply to the study of morality, the Bible and particularly the New Testament; it is

written in such an idiom, that the words are generally placed in their natural order, nearly the same as in a philosophical language or generally in the common converse of mankind, the best for dialogue and instruction. In such a language the meaning of the sentences can seldom or never be mistaken, when the meaning of the words are known: the truth of every passage can only be determin'd from the manuscripts and books in which it is contained and their authorities; if from the abovementioned authorities it seems improbable that such a passage was contained in the original, does it not appear as a deceit on the generality of mankind to print it in the translations, unless in the margin as doubtful? But is it not strange when little doubt is entertained of the truth of the different readings collected from the manuscripts, and of the meaning of them; that men should differ in the interpretation of passages deemed by many, points of the greatest importance? Readers seldom disagree about the meaning of material passages contained in other prose writers; but such is the force of prejudices from different attention paid to different matters, of hypotheses framed, of the passions and of interest.

2. What will not persons advance, support and assert as their belief? Things contradictory

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in themselves and to their own actions; an evident proof, that they really do not believe what they profess: some persons assert the absolute necessity of all human actions, necessity is the same let whatever name be adjoined: but does any one ever act agreeably to this belief? The necessarian having committed a crime, does not justify it before a judge on the plea of necessity, does not alledge that he could not act otherwise, that he has no other powers than a stone; he too well knows the hypocrisy of such a plea; and that so far from being credited, it would subject him to the ridicule, contempt and detestation of all his hearers; and if he judges the plea which appears false and contemptible to himself and to every other man, to be no plea at an human bar in excuse for his actions; how much less to the Supreme? He professes himself otherwise a coward to man; but a bravo to God.

3. In conformity to his belief he cannot act from principles of morality and religion, in truth, he cannot act at all: his motions similar to those of a stone are necessary and mechanical: but if he will honestly confess the truth, he will acknowledge that he is often withheld from committing crimes by a principle nearly allied to the former, the fear of present evil, and dread of future punishment; it prevents him

him from taking poison, from doing every act hurtful to himself and others. Is a stone endued with the same principle? Does it forbear acting from dread of any thing future, or of punishment? Does not this tenet, (the contrary being by actions professed on all serious concerns,) afford a plea for every bad action, and originate from madness or some worse disposition of the mind? If the man is not free because influenced by his good, his reason and understanding, (the understanding in all beings will approve and consequently influence,) then a stone without understanding and influence is the most free; necessity is freedom; but wherever understanding exists, absolute necessity cannot, and the more exalted the understanding, generally the greater is the freedom of will, for from ignorance can proceed no will.

4. In a similar manner does the person, who professes himself to believe the great bulk of mankind to be damned,—to be devils, act consistent with such a creed? To act consistently to it, he must act in the same manner to them as he would to future devils; he would even detest and avoid them: on the contrary he never thinks of men of good actions and sincerity being devils, but considers them as men desirable in dealings and converse, and entitled to every act of benevolence, charity and humanity:

manity: he knows that the plea for acting agreeable to his pretended knowledge of their being damned, or devils, would not afford a justification to himself, as he really does not believe in the doctrine; and would to others when considered, be the subject of ridicule and detestation, as subversive of every principle of benevolence and charity.

5. I know no other method (than the above-mentioned) of acquiring a knowledge of christianity from reading the testaments; the first apostles themselves only taught what they had seen and heard, and confirmed their doctrines by miracles: but if any one pretends to a superior method, to instruction from an angel or spirit, to divine inspiration, he has no occasion to apply to the testaments to acquire the way to salvation, he needs not attend the sermons of any man, to hear from him what that man has only learned from the scriptures or other writings, for the proof of which he can adduce no miracles and proceed in no other method but from his reasoning faculties in the same manner as all other men; but if he is compelled to learn the doctrines and their proofs by his reason and understanding from the scriptures and other writings in the same manner as other persons, he may be assured that he has no divine inspiration more than others: but what-

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ever divine inspiration he may have, if he cannot perform miracles in support of it, he may be certain, that it was never given him to publish to others, otherwise miracles or prophecy the necessary means of enforcing belief would have been afforded : in default of which all rational men will justly conclude him either an enthusiast or madman, or an hypocrite and liar, in both cases an impostor and deceiver in the most serious concerns, and certainly not truly religious ; and if deceitful in the most serious concerns, not to be trusted in other matters ; nor would a rational man reason with him on the subject, for on the one hand he can bring no proof but his asserted inspiration, and consequently afford no conviction ; on the other hand no reasoning can ever demonstrate to him to be false, what the man from an heated imagination believes to be true ; and if he does not believe it to be true, it is nearly impossible to extort confession of falsehood from ignorance, pride and self-interest : enthusiasts by such war in assertions generally conceal their ignorance of the subject, which would evidently appear by an examination : if such inspiration were given, it would seem to be more necessary and useful in countries where true religion is not known, than in those where other means are given of acquiring the knowledge of every thing necessary to salvation.

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Every one that thinks himself inspired, should examine himself, whether he knows the doctrines necessary to salvation, and can prove the truth of them and of christianity; if he believes that he can, let him prove them to others; but if he cannot, there is an end of the credit of his inspiration to every other man; for not knowing a proof of them, he knows not whether they are true from any other argument but the authority of others; and probably notwithstanding his inspiration, would have been of the religion of the country in which he happened to have been situated.

6. A man, who argues that every one possessor of the true faith, will enjoy eternal happiness as a reward for that faith whatever his works may be, whether done in conformity or contradiction to it, argues directly contrary to reason and revelation, which will ever be found to agree, as they both proceed from the God of truth; they both affirm, that the person who had knowledge or the greatest degree of faith of his master's will, and did it not, shall be beaten with many stripes, and he who was ignorant and possessed only a small degree of probability or a weak faith shall be beaten with few stripes; that every one shall be rewarded according to his works: will a human legislator admit the belief or knowledge of any laws as an excuse

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for a crime committed against them? Can any person think himself guilty of no crime, who acts contrary to the laws of God? Can a christian think his faith or belief of any avail, who acts contrary to that belief, contrary to the commands of God as given by Jesus Christ in the gospel? Must he not reason, that the superior his understanding and knowledge (if I may so term it), the greater punishment he merits for his transgressions of them: any pretended reverence paid to the name of God and of Christ will certainly be of no avail, when their commands are entirely neglected and disobeyed by acting contrary to them; in words they profess to do the will of the Lord, but not in deeds: will any legislator, will the God of truth and wisdom publish laws with denunciations of punishments, and then in contradiction to his publication declare them immaterial whether obeyed or not?

But if any person asserts, that the saving faith or belief must produce good works, then he asserts that both faith and good works are necessary; for by the assertion faith without good works accompanying, i. e. accompanied by evil works will not acquire salvation; and there is an end of all dispute, for every one will readily agree that good works are of no avail, unless produced and proceeding from a good principle;

ciple ; a true deist will say, being done in compliance with the commands of God ; and further that all our thoughts, words and actions should be directed by the same : a christian would alledge according to the commands given in the gospels by Jesus Christ : various miracles have been performed by faith and trust in God and in the name of Christ.

Experience and the gospel teach, that men do not always act according to their belief, according to what they believe to be their duty, to contribute most to their present and eternal happiness ; but a sincere belief of the gospel, of the means given either by reason or revelation of acquiring eternal happiness ; and a great and frequent attention paid to them above all other matters, will excite fervent devotion and greatly influence the actions of all men, who have not habituated themselves to vicious courses.

2. If the profession intended be the laws of the country, then it's statute laws, customs, decrees of courts of judicature ; forms of deeds, wills, &c., law proceedings, will be the objects of study.

2. 1. The lawyer must examine the agreement, disagreement and relation between the different laws, &c., and the consequences applicable to cases in dispute and further the probabilities resulting from experience and testimony of

facts whose proofs depend on known or probable circumstances and testimony; on records of court, and other given modes of evidence, to which the degrees of assent have perhaps been settled by precedent practice.

2. 2. He should likewise consider the degree of probability necessary to convict a person of a criminal offence, or to deprive him of property long in his undisturbed possession. In the first case, it is better that ten guilty men should escape than one innocent suffer; for if men were to be condemn'd on slight (I may even add without very strong) evidence all innocent persons would live in continual fear, inconsistent with happiness; on the contrary were villains too often to escape, the innocent would live in equal fear for themselves and their property; the life and security of an honest man and good citizen are ever to be preferred to that of several who have forfeited them by their crimes.—In extending mercy to a guilty person, the crime should not only be considered; but the character of the person and perhaps other circumstances, from which somewhat may be judged of the effects such mercy will produce. Lives should not be taken away unless for crimes inconsistent with the good and safety of others; however no crime should be so lightly punished as to be considered as a reward,

ward, and consequently encouragement to other persons to commit similar ones; on this principle every one should be deprived of the utmost farthing acquired by unjust means.

In punishments for crimes wilfully committed, justice seems to demand at least retaliation; in property much more should be forfeited if possible than acquired by means knowingly unjust; in cruelty as murder, maiming, &c.; similar or superior pains should be inflicted.

2. 3. A claim to property after undisturbed possession for many years should not be admitted but on the clearest evidence; otherwise persons would live in continual fear for their properties, as they might be deprived of them by false evidence, forgeries, &c., which may be calculated to give some grounds for any plea. A person not having been disturbed, affords a strong presumption of his right, for persons who have a claim will seldom leave a person long undisturbed in possession of what they deem to be their property.

All laws should be framed for the good of the whole state, and of individuals, consistent with it.

3. In physic too much time should not be spent in the study of what are called it's collateral branches, viz: Anatomy, Chemistry, Botany, Physiology, &c., to the neglect of the practice;

practice ; any great knowledge of them will seldom be wanting in it.

3. 1. The disorder is judged from every thing being in it's natural state or otherwise, i. e. the symptoms, and from them named ; and the remedies prescribed, such as have been found advantageous in similar cases from experience.

3. 2. In the collateral branches little comparison can be instituted between the knowledge of the moderns and ancients, in some of them the latter seem scarce to have laid a foundation.

3. 3. In the practice both principally proceed on the same basis, experience ; but the experience of so many later ages is added, and the origin of new disorders and remedies must have made great additions, so that the learned rather than practitioners consult Hippocrates, and no one in the present day builds his practice on him.

3. 4. In trifling disorders, the constitution, which likewise performs the greater part in all, cures 49 out of 50.

In law, in physic, the usual routine of business when acquired, is commonly followed in the practice with great facility ; but new cases require the consultation of books or persons conversant in similar matters.

5. The faculties both of mind and body can only be kept in health, and improved by a proper exercise of them, by diligence, conversation,

&c. ;

&c.; without such exercise they will remain weak and incapable of performing their respective functions to any considerable degree: it seems agreeable to a state of trial, that the living powers should in a great degree depend on the voluntary use the man makes of them. Our well being on our mode of acting.

6. Lord Verulam says, conversation makes a ready man, reading a full man, and writing an exact man.

This is founded on the principle, that exercise creates excellence in it's own way.

7. Every thing is better taught by example than precept. To improve our reasoning faculties therefore we should recur to the books, in which examples of just argumentation and demonstration are contained, and with attention examine the truth or probability of every step in the demonstration or proof; and not only read, but afterwards demonstrate them ourselves: in mathematical knowledge no book is superior on this account to Euclid; but it would be advantageous to recur also to books, which treat on other subjects; though the reading of the demonstrations of propositions on one, will certainly render us more capable and ready in understanding the proofs of propositions on a different subject; the more nearly allied the two subjects are, the more probably will the use

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of reasoning on the one, assist in reasoning on the other: besides in every science some principles or axioms, are generally to be first clearly acquired and attentively examined, before we can proceed far with safety; for the failure of which we shall be sometimes hampered in our progress.

8. Some books will teach us a habit of what I call lax reasoning, which on many subjects may be preferable; by strict reasoning, I understand that, which in every step is connected with the preceding, and consequently brings us one step on our journey further distant from the first, and nearer to the last, further from the data and nearer to the quæsitæ; it proceeds as it were in a direct road: by lax reasoning, that which does not proceed regularly from the precedent step to the subsequent, but intermixes them in any order that the mind shall think fit, or for some reasons prefer; the same steps any how placed will (when attentively considered) deduce the same conclusion: the steps necessary for the proof of one proposition may be intermixed with the steps necessary for another, or for several others; and from them the several truths or propositions may be inferred: this method properly managed may lead us in a more concise but not so clear a way to the several propositions; as many steps of one, may likewise be contained in another.

9. A proposition may be demonstrated sometimes by proving the contrary false; or it may be proved by proceeding backwards, from the *quæsitæ* to the data; this can seldom be the case in the invention of propositions; for the propositions in this case must be either known or conjectured; but this rarely happens, and is contrary to the usual method of observing and reasoning concerning nature; for we commonly proceed from the cause to the effect.

10. It will be useful for the improvement of our reasoning faculties, and to render us greater proficient in the subject, to look all around (if I may be allowed to use the expression), and examine the propositions in regard to their connections with each other, and extend them to extraneous subjects.

11. In the study of Natural Philosophy and practical knowledge, reading alone will seldom create great proficiency; clearness will best be acquired from experiments and trials; a few experiments are worth a great deal of theory: a tradesman learns his business by practice, not précept alone; and from thence acquires a facility of performing it as it were mechanically: our usual actions and even volitions proceed with the slightest attention.

12. A mechanic learns the utility of some more simple machines by instruction whether
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from persons or books, and examination; when he is become a perfect master of the contrivances or principles contained in these machines, he easily applies them to similar in others, and probably from them deduces additional contrivances, which increase his knowledge, and so on continually: let a person be very clear in the theory without having examined such machines or any thing relative to them, he will probably find difficulties of which he was not well aware.

13. It will generally be difficult for a reader or inspector to understand the structure of a machine delineated on planes; and models of it probably cannot easily be procured; but from having seen and examined the delineations of several machines, the mechanism of which he clearly understands, he will soon be able to understand the delineations of similar contrivances in others.

14. It is advantageous to begin the study of all sciences with the principles on which they are founded, for all sciences have their principles; and to proceed in a regular order, from the precedent to the subsequent, and so on till the person becomes an adept in the science: if several principles or operations are simple and entirely independent of each other, it is of no consequence from which of them the study is begun:

begun: this is the case in the operations of many sciences, in Chemistry, in Agriculture which excels all natural sciences in the utility and diffusiveness of its knowledge, &c.; and therefore it is preferable to take them as they occur from convenience.

15. Most sciences not allied to any before learned will be difficult at the beginning; but afterwards the progress becomes easy, and then rapid.

16. It may be useful to give that excellent precept of the great mathematician and statesman of Holland, De Wit: do one thing at once: for if the mind be constantly diverted from one study to another, it will seldom make much progress in any; but I do not mean that relaxation when the mind is fatigued is not necessary: the strength of the mind after fatigue is best recovered by sleep; though in lesser fatigues a change of labours and of study to others less intense, may produce a similar effect.

17. In learning the rudiments or initiation of any science, teachers will be advantageous and perhaps very necessary, till the scholar by reading finds himself enabled to proceed; and even afterwards a master may free him from difficulties which may happen to occur: or by remitting the subject for the present; and reverting to it sometime after; when the mind

has lost the train of thinking, from which at the present he may find it difficult to extricate himself and get into a new train; and likewise recovered the strength of his faculties now exhausted by labour and disappointment; he may conquer the difficulties.

18. We shall generally become more clear in any subject, and find its difficulties, by teaching; and gain a more extensive knowledge by conversing with others engaged in the same studies; from them often may be procured hints, which may be transferred to advantage.

19. In many things it will be useful before we institute experiments, &c. to acquire knowledge on similar subjects. To exemplify this, a person should acquire a competent knowledge of things in his own country, before he travels to gain the knowledge of the inhabitants, cities, customs, politics, religions, &c. of other countries, &c.

20. For confirmation or clearness it may be necessary to calculate examples or perform trials; a certain number of examples or trials properly instituted will in many cases demonstrate or prove a proposition.

21. To the reading of books of every science, a knowledge of the language in which they are wrote is necessary; of some sciences a greater, of others a less.

1. Mathe-

1. Mathematics contain in some degree by the figures and notation a general language, the mathematical part is easily understood by a master; and thence with the knowledge of a few words in the language may probably be decyphered most propositions and their demonstrations.

2. Something analogous is commonly performed by persons in languages, and I may almost say in common conversation, in sciences, and more particularly in poetry; very many words in all languages have different meanings; the same word sometimes denotes the particular or general; many different relations, metaphorical, figurative, &c.; the substance or things contained in it; things similar and allied; actions and relations substantived or personified; and vice versa, substances transformed into actions and relations, &c.; yet the mind from the ideas denoted by the remaining words contained in the sentence, readily decyphers its meaning: of this a great many instances can easily in all languages be given, particularly in rude and uncultivated ones; for their metaphors, images and allusions are commonly more striking and forcible. Hence from the meaning of a few principal words in any language being known, may be decyphered the meaning of many passages contained in most writers.

22. Most

22. Most books carefully read and examined will increase the habit of attention, and improve the faculties in addition to the knowledge acquired: pass not over propositions and their proofs without understanding them; for this often done, will create an habit of idleness and weak attention.

23. If the mind be too much unbent for a long time, it will with difficulty return to its usual vigour. Some recreations and amusements may be necessary; too much labour and study weaken the faculties and injure the health; a proper degree of them preserves and increases both: they should be innocent and if possible tend to promote in us piety, virtue, &c. and health; and never to their detriment. In different ages, different situations, states of health, &c.; different amusements, different degrees of them, and in all variety which is generally pleasing, may be proper.

24. The memory as all other faculties is improved by exercise, and particularly in things allied, and in younger years.—The memory of subjects we are somewhat acquainted with are more easily acquired and retained than of such as we are entirely ignorant of; the more perfectly learnt, the longer retained: if learnt without understanding and repetition, it will soon be lost. It may seem wonderful, as the memory

memory is so very weak and deceitful, by what means we recollect so many things of science and other matters; we depend commonly on sagacity, i.e. the reasoning faculty arguing from some data treasured in the mind to others, without the assistance of which most things would be entirely forgot, though proofs as well as things are more easily recollected from having been before known. The understanding, the inventive faculty and the memory mutually assist each other.

25. The mind when awake constantly perceives, reasons and wills.

ON INVENTION, &c.

1. To improve our faculties in the investigation of truth, we should use ourselves to write themes on different subjects; and by looking on every side of them, deduce all the arguments of any force that we can think of; this will acquire us the habit of performing the same on other and particularly similar subjects; but 1st. It is necessary to read books with attention, to institute experiments, &c., so as to acquire knowledge on the subject; we should also study books and sciences which exercise the faculty of invention: in Algebra problems are proposed, of which the resolutions are required;

ed; at first we know not the least in what manner to begin the resolution, but we soon acquire a facility of translating the proposition given into Algebraic language, and finding the intermediate steps. Mathematicians depending on this, often leave steps in the demonstration to be supplied by their readers, and properly too when their readers can only be adepts in the science.

2. Mathematicians seldom read demonstrations, but investigate them themselves; and if they sometimes prove difficult, recur to some step of the writer; or in geometrical matters to the inspection of the figures, which commonly extricates them from the difficulty—Somewhat similar is true in the investigation of truth in all other sciences, we learn some general principles, which will most commonly conduct us to the intermediate steps wanted in the proof of the proposition proposed.

3. All sciences will be difficult till we have acquired a key to their knowledge; and if the principles assumed be false, the superstructure will probably be false.

4. In most sciences the propositions are the immediate deductions of experience and observation, or contain very few steps in the proof; but in pure and mixt mathematics, several steps are generally required.

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5. The advances of science are gradual, one lays the foundation, and another builds on't.

6. In learning science, reading history, &c., when the object is the science, the story, the history, &c. and not the words; books wrote in the language of the country are generally to be prefered, as it is already acquired and more easily understood; and natural, not figurative language is preferable for information and improvement, as it is the more common and clear, and consequently requires less attention.

A person may read and understand the meaning and excellence of a work translated into his native language in a few days, which will require perhaps years to understand equally in its original: in figurative language readers often do not attend to the meaning and truth of the figure.

If an author writes therefore for his own countrymen, the writing should be in the language of his country; but if for the literati of different countries, it should be in latin.

7. The essential difference between poetry and prose is the language, in poetry being metre or rhyme; the sentiments however figurative, metaphorical, &c. may equally be expressd in prose as metre, &c.

8. Words being artificial sounds, the arbitrary marks of our ideas, can only be acquired

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by study, and retained by memory; poetry therefore as far as the language is concerned, depends on art not nature: the poet should therefore principally study the words of the language in which he composes, particularly those contained in it, which are best adapted to metre or rhyme; and class them in the memory so as readily to follow each other in verse or rhyme, or any order necessary: he should begin these studies with the reading with attention the best poets chiefly in the language, in which he means to compose; and books on poetical compositions; and with the composing of verse or rhyme; if he means to excel, from the earliest age, so as even to lisp in them; for if he neglects them at that period, he will seldom be induced to apply much time to them afterwards: in several other studies, where utility does not command attention, persons for similar reasons seldom excel, unless they begin in infancy.

9. The intent of poetry not being to instruct, for no poet is ever read on account of the knowledge contained; all knowledge is better taught and more easily acquired in prose, the common language of mankind; but to enforce good and useful sentiments, to please and amuse; every sentiment useful to those purposes may naturally be introduced; every pleasing and striking image,

image, metaphor, allegory, &c. with propriety inserted; the language should be harmonious, such as pleases the ear, of which it can only judge; but in this persons from nature and from various causes will determine differently.

10. The greatest excellence of an historian is truth: read and examine therefore all the original writers of records, and other testimonies on the subject; and from thence collect the facts, which seem to have the greater probability; the credibility of most ancient occurrences depends on the authority of two or three authors of the time, in which they happened, and their writings being faithfully copied to the present—the histories of the first, rude and uncultivated state of most nations afford often relations absurd and unnatural, and give little insight into truth and probability; are generally creatures of the imagination.

11. An historian, who publishes facts from oral and not written testimony, even at so small a distance of time as thirty years after their happening, will generally err in the minutiae; but he who publishes only from such authority one hundred and fifty years after the event, will commonly be deceived even in the great outlines.

12. He who is known to publish a falsehood for truth, or indolently a fact with very little

examination, cannot be credited in the relation of any other, and ought to be condemned to eternal oblivion; for ignorance is preferable to falsehood: and even in story and representation, which is not built on truth but utility and amusement; justice to the dead, and perhaps truth and morality require that no character or fact taken from history should be represented in a false light, the practice of it would abolish all regard to future fame.

13. An historian may give his conjectures of the causes of events when he relates them as conjectures; or exercise his invention by framing speeches proper to have been spoke on certain great occasions, when those which were really spoke, are lost or forgot; in this the historian acts the part of an orator in every thing but publick delivery; in such compositions Thucydides greatly excelled: this probable deviation from truth may be excused from the excellence and propriety of the compositions, from their being of little consequence whether true or false, and their conformity to nature and the subject.

14. Sacred writers, when they foretell the coming, office, character and sufferings of the Messiah or future facts, cannot but have been divinely inspired; their relations of past facts unless connected with the former, or expressly mentioned

mentioned from divine authority, are for any thing that we can adduce to the contrary, to be judged in the same manner as the relations of profane historians, regard being had to the purity of their characters.

15. The probability of any material facts related being true, will be greatly increased by their not being contradicted at the time; unless causes are known, which might probably prevent it: historians generally agree in the great outlines.

16. The probability of a fact related being true, is as the probability of the truth of the first relation, and of succeeding writers copying it truly, multiplied into each other.

17. Story and representation of it being the creatures of the mind may be expected to excel history in every thing but truth; to be more entertaining, more instructive in life and manners, more consistent in character, and more calculated to promote happiness, virtue and religion; but the force of truth will ever render history more useful and give it a preference to story.

18. Dialogues wrote in metre or rhyme are unnatural and subversive of their principal utility, viz. improvement in common converse: do Philosophers, do Poets even converse in metre? and much less legislators, whose laws and commands

mands should be delivered with the utmost clearness, and consequently not in metre or rhyme, nor in figurative language; figurative language may have all the pomp and pageantry of shew, and the meaning of a page in figurative, may sometimes more clearly be express'd in two lines of plain and simple language—often on examination, thoughts express'd in figurative language lose their force and beauty.

19. Representation not only relates facts, as story or writing does, but adds persons relating them in the common society, converse, attitudes, actions and passions of mankind; it may be said in some manner to conjoin natural painting with story, or to story add life and actions.

When different actions happen at any considerable distance of time, or place; they should neither be painted in the same piece, nor represented at the same time without a break: no representation can deceive any person into the belief of reality, viz. that the stage is the place where, and the present the time when such an event happened: nor that any person is the person he represents; nor that five minutes intermission is an intermission of ten years or even two hours, nor that the place of the stage is changed to another; nor in historical representation that a person in the space of several

several years shall be no more changed than in the space of an hour or two: in reading a story our attention easily passes without considering it from one time or place to another, and it does the same in representation without much consideration of the length or distance of either: the separate parts of the same story should be told as in a living picture: the persons, and the place should be drawn somewhat 'as may be supposed' agreeable to them they represent; the sentiments, the words and actions should be as near as possible, conformable to human nature or to real facts, to what has happened: one, perhaps the greatest use of representations may be the instruction of the audience, in the dialogues, in the common converse of the nation, and also in the just pronunciation; the former may be learned from reading, but things are generally better taught by example than precept; the living actions add strength to the story and things learned by a number of persons are by degrees diffused in some degree through the whole: hence they may be used to political purposes.

20. The pleasure from reading a pathetic or other story, may not be much inferior to that from seeing it acted; this generally makes a greater impression on the memory and is consequently remembered to a more distant time, but
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which, of them would be preferred if the latter had not the additional force of seeing the company?

21. Trust no authority except divine for any thing but facts; the greatest have erred in their reasonings: men differ not widely in their understandings, the most difficult proposition invented by man, can with proper application equally be understood by most others; the same may be affirmed of their inventive faculties; I believe that very few have applied themselves to the study of any science, before they were enabled to procure the principal books contained in it, but who proprio Marte have discovered some of the inventions before given, and added others of their own: examine therefore for yourself, and if it does not appear deducible from nature, reject it; there is only one road to truth; but many to error, he that knows the way to truth, knows every other to lead to error, and various are the causes that influence and mislead our pursuit in search of nature and truth; to avoid which every step should be examined with the greatest attention, and every thing that creates a wish or desire should be admitted with caution.

22. Some quote the authority of writers for the most clear and easy, being nearly self-evident truths, and some even for a proof of false propositions;

positions; some quote great absurdities for excellencies.

Dispute not with such as ground their principles on authority and not on nature, for there is no reasoning with strong prejudices: in matters of science always immutable bow down to no authority; by study and application men become proficient in every art and science; and when they understand the various improvements contained in it; the invention of no man appears wonderful, or seems beyond the capacity of men of moderate abilities, possibly not beyond their own: the ignorant think every thing great, every thing nearly a miracle; the learned approve, but not admire: I may venture to say this, because the difficulty of some propositions invented by me, have been adjudged not much inferior to those invented by any others.

23. It is surprising to observe the improvement that man makes in his faculties; he acquires an habit of discoursing in his own language as fast as he can well speak, he likewise reads aloud with the same speed, or by the eye with a greater, and understands the things read to him with the same celerity; to the understanding of which he must recollect the meaning of every word read; for the change of any one word will generally change the meaning of the sentence; though a formal definition does not occur

cur at the same time to the mind: when he is become a proficient in any science, he will understand with the same degree of swiftness every thing that he reads in books of that science; thus the grammar of a language may be read in a day or two and perfectly understood; a book of Rhetoric or Logic in as short a time; books of Morality, Philosophy, Chemistry, &c. Mathematics, by proficients in them with nearly equal speed; and every one knows that story and history are understood without difficulty and with little attention; hence the mind easily understands the improvements made in arts and sciences with which it has been much conversant; or often from some leading principles, conjectures and foresees the work: but memory is not equally strong as the understanding; for though a person understands, yet does he not remember but by repeated readings and attention:

24. Something similar is generally true of the inventive as of the understanding faculties: a man having acquired a language, and the principles and considerable knowledge of any science, is never at a difficulty to place the words (by his invention) in such order as to express his sentiments; and seldom at a loss to give a proper answer to any question proposed to him in the science: a person cannot be said

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to be master of a general rule or principle, who cannot apply it to any particular case contained in it; that person may be said to be master of a science, who on a question being proposed, can readily answer whether it can be performed by what is known in the science or not; and if it can, give the method of resolving it: the more easy the method, the greater the elegance of the solution.

25. A man having by study treasured in his mind words proper for metre or rhyme, and done the same from composing verses of his own and reading those of others with attention, acquires by degrees a facility of rendering every sentiment in verse or rhyme: instances have been published of persons repeating extemporaneous compositions of many lines in verse and rhyme; but impositions may happen, either on the part of the hearer, which may be presumed generally to be the case, when he remembers and publishes the very words spoken by the other; or of the person himself by having before composed or learned similar verses: I can only affirm that I never met with such a master of poetical language.

26. The poet often exalts his subject by enumerating the most striking and pleasing particulars contained in it; and creating similes, images and substitutions; this is arbitrary and like

other similar habits to be acquired from the reading of books on the subject, application and attention; and may thence be attained to a very considerable degree of facility and excellence.

27. In books of science, arts and of story; the sentiments, the truth and the excellence of the things contained may be judged and corrected by an intelligent reader to the end of time as well as by the writer: hence many books on such subjects have been rendered more perfect and excellent in their successive editions, and additions made; hence probably has arisen the accuracy of the demonstrations contained in Euclid's Elements of Geometry, and some other books.

28. But critics may probably not meet with the same success in correcting language, history, and any thing which has reference to former facts; for the true meaning of the words, the idioms of the languages, and the facts to which they bear reference, may for ever have perished; and all conjectures may be vain and improbable.

29. If wit consists in things ludicrous, or in things allied in words, in appearance but not in reality; morality and knowledge must differ from wit, as truth does from falsehood; as light from obscurity; a man of understanding in this sense will seldom be a man of wit, for
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clearly understanding the differences of things, he will never advance things glaringly false; nor will he study to become an adept in ludicrous images and false resemblances.

ON COMPARISONS, SUBSTITUTIONS,
FIGURES, &c.

1. Comparisons may denote relations of magnitude, intensity, &c. as to degree, viz. the positive, the comparative, the superlative; or any relation or similitude: *similes* denote the likeness of one thing to another in some of their properties, qualities or actions; the more exact the likeness, the superior *cæteris paribus* the *simile*: the similitude in things which express the *simile* must be better known and more striking or pleasing, affectionate or passionate, &c. than in the things themselves; otherwise the *simile* will be of no use.

2. When the comparisons as in *Hyperboles* widely differ in degree, which are mentioned as analogous; then a falsehood is asserted; when the falsehood is perceived and striking, the comparisons will be censured; for no well disposed mind will ever be pleased with an obvious and clear deviation from truth, or think it excellence. Every thing correspondent *mutatis mutandis* may be advanced concerning oppositions.

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3. In teaching knowledge similes are generally useless; for if either the two similitudes or things likened are exactly the same, the reasoning from one will be the same as from the other; but if the similitudes are different, then reasoning on conceptions from one to the other will draw us from the truth accordingly: similes always suppose some ignorance of the similitude express'd in the things themselves, and a superior knowledge of those which express the simile; and are consequently more useful, striking and better calculated for persons ignorant of, than acquainted with the subject of the simile.

4. In common converse similes are seldom used; persons generally relate every fact, every thing useful in the plainest and most intelligible manner possible, and never have recourse to similes or substitutions as figures, &c.; unless such as are in common use in the language: hence as truth, clearness and knowledge increase, the use of similes and figurative language diminish.

5. In strong feelings or passions, the mind never studies for similes, figures, substitutions, &c.; but in violent ones uses the strongest words expressive of the passion immediately occurring, i. e. in common use, and tones expressive of them; but in deprest passions it uses very few words, if any; they are accompanied
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by great internal depression of all the faculties and actions, often by tears; by words denoting the grief, cause and effect; in a dejected tone.

6. Substitutions in language are used of one thing for another in some manner connected with or related to it, though in other respects widely different; as things animate and inanimate; sensations, relations and feelings; substances, properties, actions and sufferings; things present and absent, past and future; cause and effect; particular and general; parts and whole; words and things; &c. time and place and things connected; and endowing substances and things with faculties which they do not really possess, or depriving them of some of their own.

7. The meaning of the words denoting such figures, substitutions and similes is to be collected from the remainder of the sentence or sentiment they are connected with; it may be deemed deserving of censure, when not sufficiently obvious; or two or more meanings may equally be inferred: but sometimes the decyphering of it is not without difficulty, unless it is commonly used: persons in reading often do not scrutinise the exact connection and meaning of the words: the better the facts mentioned, correspond to the thing itself and its substitution; the better *ceteris paribus* (if I may

may so term it) the fable; they should at least agree in some of the principal traits: these substitutions should be carried on through the whole fable in the same meaning; for if they are sometimes exprest in one sense, and sometimes in another; it may be difficult to explain them.

8. When things are said to have different properties; whether in ænigmas, language, &c.; consider the things which have each of the properties separately, and then exclude those which disagree; or which is the same, retain those only which have two and thence three and so on to all the given properties, and consequently to the solution of the ænigma or question.

ON THE EXCELLENCY AND SUPERIORITY OF WRITINGS.

1. The excellency of writings depends on the excellency of the language, and sentiments; but principally on the latter; for any words repeated without sentiments, i. e. without their meaning being understood, are empty and nugatory sounds; but the same sentiments conveyed in any language whatever, or if possible in no language at all, will (if clearly understood) contain the same strength, wisdom, goodness, sublimity, beauty, pathos and every other

other excellence; and also the same similitudes, images and substitutions.

2. The best, the compositions of most value, as far exceeding all other as infinite does finite; are those, which by example, precept or story, teach the means of acquiring eternal happiness, &c. which excite the greater fervency of exalted piety and superior humanity, and more restrain our vicious passions and inclinations; such as create the most sensible, the most lasting impressions on the mind of piety, benevolence, humanity and every good thing; impressions which produce actions and regulate our lives; and not like fleeting shadows passing over fields of corn leave not a trace behind: such compositions it is the duty of every one to read often at stated and other proper times, with the greatest attention possible; and in all his actions to be directed by them, and from thence acquire habits accordingly.

Those claim the second place, which teach mankind something useful to their support and well-being in this state.

Thirdly, those which strengthen and improve the understanding either by example or precept; these may sometimes be included in the preceding, but should never be pursued to their neglect.

And lastly, what will innocently amuse the
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mind, and keep it free from idleness and every thing hurtful.

3. Thus far as to the advantage of the readers, but as to the superiority of the writers.

Can the different faculties of the mind, perception, reason, invention, volition, actions of the soul on the body and moral faculties; and consequently can their allied productions in arts, sciences and morals be properly compared together; utility must ever be deemed the principal source of excellence; superiority in this respect must be collected from the aggregates of the probabilities multiplied into the correspondent happiness to be received, or misery to be avoided.

4. When nothing of utility occurs; superiority must be left to every one to determine, and it will be different in the judgement of different persons: in reasoning and invention, (exclusive of language) as appears to me; it should be inferred from the number, novelty and difficulty of the propositions invented; and the superiority of each proposition invented, from the number and different connections of the steps with each other; and ~~their~~ ^{its} extensiveness and application, as far as given by the writer himself.

5. In most propositions there is no new step contained, all the propositions of Euclid are deduced from his axioms and postulates, i. e.

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assumed theorems and problems: most of the propositions subjected to calculus in Natural Philosophy are derived from the same, and the few principles before mentioned deduced from experience: the truths in logic and moral philosophy are founded on fewer principles than the abovementioned sciences: but though the first principles may be given, the propositions deduced from compounding them in a different order must be deemed new inventions, e. g. the propositions of Euclid, must be esteemed new inventions though contained in his axioms: 2. the finding the fluxion of an irrational quantity; and the deducing of a second fluxion from the first, in the same manner as the first is found from the fluent by Newton; the deducing the fluxion of an exponential quantity by John Bernoulli; the finding the fluent of an irrational compound algebraical fluxion, and some fluents from others by Craig, Bernoulli, Newton, Euler, in the *Meditationes*, and by others; the deriving from thence that the fluent of no fluxion, which contains a simple divisor in the denominator can be expressed in algebraical terms by Newton; and the same of any fluxion, of which the dimensions of the variable quantity in the numerator are less than its dimensions in the denominator by 1; and the principle of finding when the area, &c. of an alge-

braical curve, can be found by an algebraical equation expressing the relation between the area and absciss and ordinates contained in the Philosophical Transactions of 1763: and in the Meditationes; with many others given by Bernoulli, D'Alembert, Euler, Le Grange, and others, and in the Meditationes; must be deemed inventions; though the first principles of fluxions were before given by Fermat, Barrow, or others.

6. It was (I believe) first observed in the *Meditationes*, that motion was not necessary to the integration of quantities; or which means the same thing, the finding of fluents and fluxions; for if the parts of an algebraical and geometrical, or other quantity agree or are always equal to each other; then the wholes or integrals will be equal.

7. In a similar manner from known principles, Taylor and Mommort, &c. found the integrals of the two increments $x \times x \times x$, &c. and $\frac{1}{x \times x \times x \text{ \&c.}}$; x , x , &c. denoting the successive integrals of x , x , &c. &c. other propositions on the subject have been since added; in the *Meditationes* from similar principles, are given methods of finding whether the integral of any algebraical function of one or more variable quantities can be found by finite terms

of them, or logarithms; and correspondent propositions to most of the abovementioned fluxional added—these must be deemed equally new invented propositions.

8. The acquisition of some knowledge depends not so much on reasoning as on experience, i. e. trials and observations, e. g. geography, which describes the principal and remarkable places and boundaries of countries; these can not be settled by reason and invention but by actual surveys, and the finding the latitudes and longitudes of places; their accuracy must depend on the care and skill of the surveyors; and the excellency of their instruments, probably invented and made by others: these surveys or observations performed several times; and a mean of those, which to the observer seem to be the best taken, will generally give a more accurate result, than when collected from one survey or observation only; unless the vigour and attention of the mind in the prior be remitted: the errata from the instruments only will remain the same as long as the instruments, and every thing that acts on them so as to contribute to the observation, remain the same; and the errata of the observations arising from these different causes, may be calculated from their different errata: the errata from the deficiency of care and skill must be supposed when

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no reason can be assigned for its erring on one (the affirmative) side of a given quantity in preference to the negative, to be sometimes on the one side and sometimes on the other; and thence in most cases the mean of several observations will err less from the truth, than one taken indiscriminately: if an hypothesis was assumed for the probability of the happening of every erratum; from the law assumed may be deduced the correspondent probability of the abovementioned mean being contained between given limits.

Similar principles, i. e. the mean of more attentive trials and observations may be applied to the operations of Chemistry and of natural appearances in general, and even of the faculties of the mind; for none of our faculties are perfect, and the first deduction of the mind is seldom to be much depended on; subsequent observations or deductions are generally more to be depended on than the preceding.

9. The earth being bounded no where by right lines, but constantly unequally ascending and descending from the horizon; a source of inaccuracy will thence arise, and consequently some error in the geographical distance; unless the exact angles of ascent and descent were constantly taken; but some inaccuracy in every thing

thing will occur: the errors in measuring the surface of the earth, generally stiled measuring land, will commonly in proportion far exceed the errors of the distances; most fields are seldom nearly level as a plane, but generally banky in their different parts; and every surveyor who is perfect master of the art, may by the common mode of measuring in some cases considerably increase or diminish the measure of them: thus in a field, of which part is on one side of a hill and part on the other, if a line be drawn straight as possible from a corner on the one side to a corner or angle in the other; and if perpendiculars may be drawn from an opposite corner to the same line on the different sides of the hill, which in some cases will differ in a great proportion, then consequently the survey of the land as abovementioned may be made to differ in that proportion: in somewhat similar a manner, if banks are contained in the middle of a field, the measure of the field will differ according as the bases and perpendiculars are drawn: similar principles may be predicated of the boundaries and lines drawn to the angles from any given points.

10. The excellence of history primarily depends on the truth, number and importance of the facts related in it; and secondarily on its being delivered

delivered in a natural order and agreeable language: wisdom and prudence are learned from past experience and examples of others; the errors committed by persons admonish us to avoid similar ones, and their success encourages us to pursue their steps: history teaches the lives and manners of men and their consequences; feigned story does the same, but never creates equal attention and confidence, nor so lasting an impression.

11. History and story should generally proceed regularly as to time, physics as to cause and effect; i. e. precedent and subsequent events, and reasoning from known truths to unknown.

12. Writings of lesser moment, which barely concern amusement and not utility or knowledge, have no fixed standards of excellence; and can only be said to be agreeable, pleasing, striking, or to excite some other affection; but these will be different in different persons, according to the education, business, studies and various occurrences of their lives: principles of amusement cannot be generally described, they are derived from an innumerable number of sources.

13. The poet's fancy wanders through the whole regions of nature and learning, in search for similes, images, and substitutions, striking and pleasing to the mind; to raise, exalt and dignify,

nify, and sometimes familiarise his subject: one subject indeed, the Supreme and his attributes, sublimity itself, whose actions in grandeur, greatness, wisdom and goodness, &c.; infinitely superior to the utmost stretch of conception of the most exalted creature; can never be raised by any similes, images or substitutions; some of his actions may be particularised, and some brought to our level and rendered more familiar by them: every simile depresses, not exalts this subject.

2. But should any similes, &c. be deduced from the heathen mythology; from falshood, absurdity, immorality and impiety? Should an author intermix the knowledge of our Creator and Governor with the absurd and immoral tales of the heathen gods and goddeses, things contradictory and entirely inconsistent with each other? If the latter are introduced as founded on truth, a falshood is asserted; but if introduced as false and impious stories, should they not be rejected as such? What utility can be produced by studying them, is it not loss of time and filling the mind with impious and immoral stories to the exclusion of useful knowledge? Is not the Almighty a jealous God, has he not commanded us to have no other Gods, nor graven images, nor likeness, and as it should seem consequently no great

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allusion to any other, nor much attention? Would it therefore not be desirable, that heathen mythology should be condemned to eternal oblivion? I only ask these questions, let others determine them.

3. The most forcible and exalted language, similes, images and substitutions may be proper and useful, for the exaltation of sublime subjects in poetry; and exciting more fervent devotion in psalms, particularly when they have been commonly used for that purpose, and in a common tone, the same tone will generally produce similar effects; for the passionate threatenings and denunciations of vengeance, and for many other subjects; but of this let every one judge from the effects produced in his own mind.

4. The description, images and substitutions on religious subjects contained in the sacred writings: viz. on the power, knowledge, wisdom, and goodness, (attributes necessary to the governor of the Universe, and in some degree to every inferior); on the creation, providence, the majesty and glory of the Supreme; the pride, impiety and oppression of men, and from thence the misery; the swift destruction and desolation of cities and countries; the pleasing descriptions of universal peace and happiness; of death; the light of the gospel, salvation of mankind,

mankind, resurrection from the dead, and future judgement; are eminently superior to any contained in the ancient writers.

5. In imitations it is preferable to begin our study with instructors, books, capital performances of eminent men, and lastly to proceed to the study of nature itself, and examine the works of others by it: excellence is to be deduced from comparing and observing the similitude, resemblance and connection of the several and particularly the principal parts, appearances and actions: copy nature in itself, nor pretend to excel her, by taking different parts from different subjects, for they will not naturally agree together, and our understanding is little able to discover what is the more useful and superior, otherwise than from the most strict adherence to nature. That work must be deemed superior, which best resembles the original, particularly when it is the most beautiful and striking in nature, and most known and excellent in story, for those imitations should generally have reference to something known; and that most pleasing which best copies nature in her most beautiful and graceful form and dress—superiority in imitation, in utility must be determined from experience and reason; beauty, grace and other affections as before said, have no fixed standard,

but are derived from conformable feelings in sensation and utility.

6. Persons of superior faculties may in some respects from their own sensations judge something of the correspondent ones of beings of inferior; but on the reverse, persons of inferior faculties can never determine concerning the sensations of persons of superior; e. g. a line may appear crooked to a person of a microscopic, but straight to one of a common eye; the former by his reasoning faculties can prove the appearance of the straightness to the common eye, but the latter can never demonstrate the crooked appearance to the microscopic; something similar seems probable concerning colour and other qualities; and similar truths may be concluded of all the senses and faculties.

7. In natural phenomena, as before mentioned, the same causes produce the same effects; but on the contrary, similar effects may proceed from different causes: in life and manners the same effects may proceed from different causes; and also, in voluntary actions, the same causes may produce different effects; whence from few voluntary causes is produced a certainty of the effects, but different degrees of probability; the causes of our actions generally are and ought to be, a consideration of future probable events,

events, as to happiness and misery, agreeable and disagreeable.

8. In a system of life and manners all different causes, circumstances, actions and relations, not only when separately, but when associated any how together, happening to different persons at all ages; possess of all different tempers, dispositions and habits; in the various passions and states of health, of mind and body; and endued with the various knowledge of manufactures, arts and sciences, of life and manners; and entertaining the different principles of religion, morality and policy; and similarly to nations; are to be considered, and the usual consequences deduced; they may be classed under general principles: the consequences or effects can be deduced only from past experience and observations of similar ones: and thence innumerable stories amusing, instructive and useful, may be framed.

From hence, namely experience; from reason, and advice, precept and example of others may be collected, the causes most likely to produce any effects in life and manners; from whence and the avoiding all temptations to every thing bad, and promoting with zeal all tendencies to good actions, from keeping good and avoiding bad company may be deduced the cure and reformation of all bad thoughts,
words,

words, actions and customs; and the promotion of every good.

ON TASTE.

1. Our actions, our inclinations and taste, should be directed by morality, utility, ease and convenience; regard being had to future as well as present; if our taste, our inclination be perverted in contradiction to these principles, it should be corrected and amended agreeable to them; but in matters where the abovementioned principles are not concerned; where we have no standard of determining either from nature or reason, our actions, taste and inclinations are generally and properly subjected to habit, and fashion and education generally conformable to it; the former cannot be removed without some difficulty and uneasy feelings; and a complaisance arising in some degree from benevolence, creates a pleasure in acting and reducing even our inclination and taste in conformity to the fashion, i. e. to that of the generality of the persons we are conversant with; but fashion founded on no principle of utility will vary with time, and cannot be deemed perpetual; a taste, or actions in opposition to the fashion, will commonly appear awkward and disagreeable.

2. It

2. It has been controverted, whether our taste in subjects of no great utility should be directed by the fashion of the ancients or the moderns; on such subjects men will generally please themselves; some persons from education, regard to antiquity, or the pride of literature, will prefer the ancients; others from complaisance, will conform to the taste of the present time.

3. If it be said that our taste should always be subjected to nature: nature possesses little order, unless required by utility; she places vegetables in soils proper for their nourishment and increase in an infinite variety, and consequently in very little order; it being her intent, that man should cultivate the ground in the manner most useful and pleasant to himself: but in every thing that utility requires, nature invariably follows its direction.

Similarly should be the taste of man, when no standard from nature or reason, even to a distant utility can be deduced; a great, perhaps an equal latitude may be allowed; and fashion, inclination, habit or association, become the standard: by association what is offensive to one sense, becomes disagreeable to others, and even to the recollection.

4. If it be advanced that our taste should be directed by a pleasant sensation or feeling,
agreeable

agreeable acquired associations; a conformity to some design or appearances of distant utility; grandeur, beauty and novelty; or some other cause: in the former, our own sensations, feelings and associations must direct us; and in the latter, our sensations, judgment and reason.

5. In writing the sentiments should follow each other in a regular and connected order; it being advantageous both to the understanding and memory; they should proceed from the origin in the natural order, to the conclusion of the story; from the cause to the effect: another rule, that feeling seems to indicate, is, that they should proceed from things less pleasing, and lower, to more pleasing and exalted; from matters of less importance, to others of more; for if they proceed in the contrary way, the expectations will first be raised to a higher pitch, and then the mind will be disappointed on their being depressed: in many things the mind becomes weary, and requires an exaltation of the subjects to keep it in an equal, or raise it as it proceeds to a superior tenor; hence it is generally pleased with any unexpected pleasingness or excellence, unless counteracted by some contrary feelings.

ON THE STRENGTH OF THE FACULTIES
OF THE MINDS AND BODIES OF MEN OF
THE PRESENT, COMPARED WITH THOSE
OF FORMER AGES.

1. The moderns can with ease understand all the knowledge, propositions or arguments delivered by the ancients, and when understood see the truth or falsehood of them; it equally appears from what has been published by the ancients, that they could as easily have understood those, which have since been discovered by the moderns.

2. The ancients invented propositions of equal difficulty in mathematics, in various arts and sciences, and made as rational observations on the lives and manners of men, as those since adduced by the moderns: may we not therefore conclude that no proof can be assigned for the superiority of the mental faculties of the one to the other.

3. The first principles of all knowledge may be deemed the observations of experience, and not the deductions of reason; hence every fact not deducible from others before known, may be esteemed a first principle; the more particulars included in it, the more general the principle: it is reasonable to suppose, that those in the most necessary and useful sciences would be

first learnt, either from nature or inspiration; and consequently be given by the ancients: in experimental philosophy, the observations should if possible be subjected to calculus, or no great advances can be expected from them; in later times, Kepler discovered the areas described in equal times round the sun, by the same primary planet to be equal; and the squares of the periodical times to vary as the cubes of the mean distances of the planets from the sun, which he found to be situated in the focus of the ellipses described by them. From whence has been deduced almost the whole of the present excellent system of physical astronomy.

4. It should seem probable reasoning a priori; that rational piety, benevolence, humanity, true magnanimity and heroism of mind, resignation to the divine will and obedience to its commands would be superior; and the actions of mankind more virtuous and less vicious since the publication of christianity, as the former are excited, and the latter restrained by arguments of superior force and probability; otherwise regard to future; to infinite happiness, and to the avoiding of misery, has little influence on the actions of man.

5. All mechanical bodies, space and time, sensations and mental faculties, must be supposed nearly, if not perfectly correspondent in their

their properties and relations in the present to what they were in former ages.

6. The strength of the body and its faculties in past times, cannot so satisfactorily be determined; as we have few proofs to be depended on, of the height, measure, speed, weight and force of men of former times; this is somewhat surprising, as the height, measure and speed, can easily be settled, either from known distances and time, or as is now known from the space a body falls through in a given time; and the weight and force may be deduced from the weight of a determined measure of any known body; but it may require many experiments and measures to affix the standard as to the medium, and perhaps the ancient philosophers were not so much given to measures and calculations as the modern.

To reason from the little knowledge we possess on the subject: 1. The generality of men live in the present time, nearly to the same period that they lived some thousand years ago; but is it not probable, that if their bodily strength had been weakened by disease, &c. they would not in general have attained to the same period of life?

2. If we compare the strength of men of the present times, with those of some ages immediately preceding, experience will not discover a difference.

3. If we argue from husbandry and other works to be performed for the necessary uses of life, we shall not conclude them greatly unequal; but nature to every living being allows not only the strength, which is absolutely necessary for its common support and preservation; but superadds much more for its convenience, ease and pleasure; otherwise too much fatigue would generally ensue.

4. No superiority of greatness of body can be collected from the remaining Egyptian mummies.

5. If we reason from the works known and remaining, we shall conclude the buildings, canals, &c. of the present age in general to be superior to those of the past, both in utility and greatness: but if from the pyramids of Egypt, or some few particular monuments, &c. of great structure; it may be answered, that under the same circumstances, the same tyranny and oppression exercised by one nation or people on another, &c. equal works would be produced.

6. Hence by reasoning from experience of what has been done or happened, (extraordinary interpositions of providence excepted) no difference can be adduced of the mental and bodily faculties of men in the present and past times; and probably the faculties and properties of man,

man, of the respective animals, of vegetables and fossils in future will not differ widely in the same circumstances from correspondent ones in the present day.

7. In the present greater application and study is necessary to become an adept in arts and sciences than in ancient times; as the moderns have discovered many new sciences and carried the knowledge of the ancients to a much greater extent, and accuracy; it is necessary therefore for that purpose not only to learn the inventions of the ancients but also the additional ones of the moderns: thus far as to knowledge; but as to languages the ancients seldom and perhaps never learned any languages from books only; but from the converse of others, in the same manner as every one learns the language of his native country; the Hebrews and the Greeks originally only learned their own language, or the latter in some very few cases their own and the Egyptian; the Latins, their own and the Greek; but in modern times the literati generally from books only, learn several languages, sometimes unnecessarily, in addition to their own: the road to knowledge through any but the native language, is round about, useless and unpleasant, laborious, and rarely in the acquisition of any useful knowledge, but of divinity and commerce pursued.

8. The

8. The modern invention of printing has rendered the means of acquiring languages by books more generally diffused and more easily procurable. A moderate scholar in the present time on the whole, is probably superior in science, to the most learned of the ancients.

9. The moderns generally excel in manufactures and arts; they commonly examine the truth, reason and principles of things in every science (mathematics excepted) more to the bottom (if I may use the expression): their principal languages are more accommodated to converse; the understanding, and acquisition of knowledge; being more plain, easy and natural in opposition to the more inverted, difficult and figurative, of some of the ancients. Some moderns from obscure passages, which construed in their utmost extent mean very little, or nothing; would conclude the ancients to be possessors of knowledge far beyond any thing contained in them; and which is expressly contradicted by the greatest absurdities of the several authors, on the same subjects; proving not only their own ignorance, but the prejudice of such modern writers.

10. An argument in contradiction to the opinion before mentioned, has been published: viz. mankind by their luxury and vice render their progeny weaker, and consequently every succeeding generation will be weaker than the
preced-

preceding: arguments deduced a priori, and not from experience, in such matters are seldom conclusive; this argument supposes every man to produce a progeny, of which none are stronger and more healthful than himself; but this is contrary to experience: a profligate, diseased and debilitated man, will probably generate children disordered and weak; but the children, grandchildren, &c. will either die, or by regular living and healthful food, wear out the weakness and disease, and restore the former health and strength; such a power of restoration prevails in man: whence human nature generally vibrates between certain limits necessary to its existence, actions, business and ease: the generality of mankind in every country live moderately regular, either by necessity or choice; there are very many instances of persons of regular lives at an age between seventy and eighty, and consequently to be supposed weak in body, begetting children which became strong and healthful persons.

11. Some poets have described men of preceding ages, as possessing double the strength of the succeeding; a description, which renders it very probable, that the authors lived several ages after the subjects on which they wrote, which may in some degree account for the credit they gave to the false, ridiculous and impious

pious stories of their gods and goddesses, and even of Jupiter their strongest god, and independent Supreme, whose will was supposed fate, and who commands all things; for the wisdom commonly assigned to them is folly, the actions vices, and power weakness; not much superior are the tales of the heroes and their battles; such as cannot happen in the present times, and therefore useless and uninteresting; and such as never happened in any former time, and therefore false and absurd: equally unnatural and absurd are the many feigned creatures the vitious (as contrary to reason and experience) productions of a luxuriant imagination.

12. In the same manner as the great Bacon in his wisdom of the ancients sometimes proceeds, whose attention is generally fixed on creating similitude, may almost any one thing be deduced from any other, by genius and subtilty; he too often delivers obscure wisdom, consisting much of similes, and substitutions; and frequently gives conjectures, not proofs. Persons must have been highly absurd to have delivered and concealed the plainest truths in the most obscure ænigmas. However it must be acknowledged, that the ancients were much given to deliver their knowledge in far fetched allusions.

13. The

13. The Iliad, the Odyſſey, the Æneid contain facts, moſt of which are ſelf-apparently falſe; but when ſuch unnatural facts are contained, it evidently follows from the internal evidence, that fancy not truth was the object of importance with the writers, and thence every fact built on the relation of ſuch authorities only muſt be deemed if we reaſon concerning them, in the ſame manner as concerning others, more probably falſe than true; and the whole poems, the creatures of fertile imaginations: add to this, ſo little external evidence can be adduced in favour of the outlines even of Homer's poems, and ſuch ſeems from the above reaſon, the diſtance of time between the ſiege of Troy and the writing of them, as to render the oral teſtimony of every fact imperfect and uncertain, and the relations of moſt of them aſſuredly falſe.

Theſe conſiderations of the internal and external evidence muſt create a doubt, if not a diſbelief of every fact contained in the before mentioned poems, which is not corroborated by other authorities.

14. The intended moral of Homer's Iliad, has been ſaid to be: "delirant Reges, plectuntur Achivi:" but does this appear from Homer? for he never utters ſuch a political maxim; he only invokes a goddeſs to ſing the anger of

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Pelides

Pelides Achilles, which proved destructive to the Grecians, and which destruction (he afterwards mentions) was produced by Jupiter to confer honour on Achilles, in compliance with the petition of Thetis: the *Iliad*, the *Odyssey* the *Æneid* seem only to contain tales amusing to the mind, and to have no moral nor useful design; unless that of encouraging sacrifices to the gods, which are generally inculcated as a duty; and the offering of them represented as fortunate, and their neglect punished: the disposition of mind which produces piety, is commendable, when sincere, though erroneous; the worship of the Supreme founded on rational and consistent principles is certainly the most sublime moral, that human nature can devise: these poems were probably founded on the mythology and tales of the times; but I must refer it to others; how far the spending of years in learning such tales is useful and expedient? Truth and nature in all ages are the same; real excellence in one age, will be the same as in another.

15. The ancients excelled in oratory, in pleading of causes; it was the principal employment of many the most distinguished for abilities: in this the language and the arguments are to be considered; the language whether delivered to the people, the senate, or the judge, ought

ought to be the most clear and perspicuous; the only use of it is to express the sentiments; if the same sentiments delivered in the same order are clearly understood, they will have the same force and conviction on any rational mind, whatever may be the words which express them; and answer all the purpose intended; for the sentiments, not the words are considered.

16. With regard to the sentiments, the ancients and moderns are situated on a level as to the advantages: no knowledge, no arguments are necessary; but what are derived from the cause in dispute, and its circumstances applied to the general principles of justice, humanity and expediency or policy; the laws of the country and of nations: of these, persons of equal abilities and applications in all times could judge and determine equally: to compare them together, write down all the facts contained in any of the orations of the ancients, and proprio Marte, deduce the different arguments resulting for and against the question, and the apparent probability; they will generally be found such as are contained in the oration; but if any arguments of much force should be omitted, it argues a weakness of the understanding or attention in the one or other: in the arguments for and against the question, may be said to be contained all the real force

of the cause; and what remains is to enforce them on the minds of the judges, i.e. to bring them forcibly and clearly home to their judgments and bosoms.

17. The different parts of pleading are said to be the narration of the cause, the proof, the confutation of the opposite, and the enforcement of the arguments.

The force and strength of arguments will generally be concluded agreeable to past experience.

ADDENDA ON TIME, SPACE AND FEELINGS, &c.

1. Time only means precession and succession; space, distance and its one, two or three dimensions, length, breadth and depth; motion suggests a fourth dimension, a quantity as great in proportion to a solid, as a solid to a surface; and imagination innumerable. To proceed downwards, points have been supposed in different ratios to each other; and in the Philosophical Transactions the point in which a globe touches a plain has been deduced from reasoning equal to a line: by imagination and similar reasoning, points may be deduced of different dimensions.

2. Time appears to man longer, as the continuance of the same ideas or succession of different

different seem longer : a given time appears longer, when an uneasy feeling or painful sensation principally continues in the mind ; and the shorter as the opposites prevail : when there is no idea in the mind, as in sound sleep, there is no perceptible time ; and when none but agreeable ones, the time seems short, and we wish for the lengthening of it ; but in this state weariness will occur, and the time seems ultimately long, till sleep recruits the spirits—on this principle, the more happy and less miserable the situation of beings, such as man, the shorter to them the appearance of time : from hence no measure of it can be adduced, nor even from the succession of our ideas, for we never enumerate the number of ideas which succeed each other ; nor if we did, could we tell the time, for every idea does not remain an equal time before it is succeeded by another.

3. Time is generally measured by us from the motion of bodies, space from measures of distances, angles and time.

4. Feelings differ in strength, in force and violence, in being pleasing, displeasing or uneasy, agitated, depressed and in various other ways : when pleasing feelings and sensations are continued for a length of time, they create happiness ; and when displeasing and painful, misery.

5. Sen-
sations

5. Sensations contain pleasure and pain; feeling, joy and grief; joy arises from pleasing, grief from displeasing and uneasy feelings: by pain in feeling, is often meant a great uneasiness: feelings cannot be distinguished by a great degree of resemblance; nor from enunciation only, similar ones produced.

6. In some cases the recollection of the causes, which produce them, will create similar but more weak feelings on the mind for a considerable time; but commonly after a short time, the memory of their existence only remains from a recollection of their causes and effects, and of the violence of them.

7. The mind in violent feelings or passions seldom much notices any thing, that has no relation to the passion; but if it does notice any thing else, it generally creates a relation, or refers it to them.

8. As the mind can only reflect on one subject at once, so only one passion can exist in it during the same time; but when more agitate the mind together, it constantly recurs from one to the other, and generally dwells principally on the most violent.

9. Strong and violent feelings from similar causes, commonly produce similar effects on the language, the actions, the voice and countenance of man; we generally reason from the
cause

cause to the effect, and drop the intermediate feeling: every man therefore in some degree judges of the feelings of others from his own; and also on the effects of similar passions: by some causes or feelings, men are rendered more benevolent, by others more cruel; and so of other passions.

10. From what has been said, it appears that the effect of each passion and feeling may generally be known from a man's experience of it in himself, e. g. Anger in the first moment commonly produces threatenings, and a desire of correspondent revenge, which goes beyond the bounds of prudence; and is soon repented of on moral and other considerations, or from a soft answer given: the anger returns on a fresh provocation with correspondent force, and is similarly repented of.

2. Love and grief for the death of a dearly beloved object prey on the mind, and like madness keep almost sole possession for a long time, perhaps to some degree through life: the thoughts in the former, will be on the perfections and fear of losing the object; in the latter, on the loss, the dear connection formerly subsisting, and reciprocal good offices; and in both cases pungent sorrow for any thing, by which we suppose ourselves to have displeased; and in the former, ardent wishes to please.

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The mind agitated by these passions, in absence of the object, seeks solitude to reflect on its own feelings. In a similar manner may the causes and effects of all the passions be enumerated.

11. Violent passions seldom continue long, their violence exhausts itself and produces sleep, the sweet composer of all feelings; whereas strong but not violent passions keep the mind too much wakeful, and often continue a long time. Violent or strong or deprest feelings agitating the mind for a long time, without sleep or intermission, generally produce madness.

12. The same feeling may be pleasing and agreeable on some accounts, and displeasing and disagreeable on others; and similarly vary in all different ways; or change by innumerable causes.

13. Similar feelings may add force to each other, but different ones diminish the force of each by withdrawing the attention in some degree from it; and much more opposite counteract each other; the weaker diminishes the strength of the stronger: the passions may therefore be lessened by using every means of producing others of a different or contrary nature; or if possible finding some means of removing the cause or gratifying it.

14. Repe-

14. Repetition of similar feelings often diminishes the attention to them by others intermixing, and thence destroys their force. A person of great sympathy by being constantly used to objects of distress, becomes callous in similar cases; as a judge, a physician, or surgeon, &c.; this is wisely ordained by nature, for were it otherwise, every humane person in such necessary stations would become miserable by exercises of humanity.

15. Sensations of the different senses occurring and actions regularly performed at stated times become necessary; and the want or deficiency of them at those times, create disagreeable sensations: something similar is true of the feelings, for though repetition without much attention diminishes their force, yet the deficiency of that repetition produces uneasiness; hence custom and habit influence our obedience, and hence we should guard against every vice, against reading immoral stories unless with abhorrence, against inhumanity, selfishness, &c.; these depress human nature, and render us miserable both in this state of existence and the next; and lessen our hatred to vice, and regard to virtue: vicious habits take such hold of the mind as not to be subdued without the greatest difficulty, though they tend to misery and destruction; but generally example will succeed

better than precept, and also the abhorrence excited by reflecting with energy on the evil and misery produced by them, and the using every means of restraint possible, and every provocation and incitement to actions of a contrary nature, will tend to the subjection.

16. Pious and benevolent feelings and inclinations may be increased by attention to their causes and effects; by reading and hearing of examples of piety and virtue exciting in us fervent emotions of duty and benevolence; and by examples of their opposites producing abhorrence and detestation; by reading pious, moral and religious books, &c.: these different acts and sentiments will exalt and improve each other.

17. It being in the power of man to vary, to exalt, or debase his feelings by his own mode of acting, and consequently by the understanding and will; he becomes the subject of moral government; and his feelings, thoughts, words and actions, should be governed by convenience, civility, decency, reason, morality and religion, e. g.

1. The violent passions should be prevented or restrained by arguments of utility, precepts of morality and christianity and their consolation: the not restraining these passions, adds to their increase and frequency.

2. Moral

2. Moral and christian duties may be improved; by paying the strictest attention to a regular discharge of them with the greatest integrity and sincerity: e. g. we should take care to fulfil every just engagement in the sense that we meant to promise, *bonâ fide*, without any collusion of mind whatever; promises made contrary to morality and religion are consequently void, and mistakes should be rectified from principles of benevolence and publick utility: in every action of our lives, the last generally of the greatest importance, the disposal of our effects at death, we should be actuated by principles of justice; our just debts and proper funeral expences should be paid; and the residue disposed of according to the claims of relationship, gratitude for favours received, friendship, charity, &c.: the claims of children from parents, and parents from children, unless forfeited by bad behaviour, are very eminently superior to the claims of other relations: are not all children equally related to their parents, and from thence have an equal claim on them, regard being had to the age, at which they become possessors of the property left, and in some cases to considerations of private or publick utility? Is not injustice on the death bed, on leaving the world, in the last and often the most important act of life, originating from pride, of the most serious concern?

18. The feelings of piety, humility, gratitude and sobriety, may be exalted by reflecting on the power, wisdom and goodness of the Supreme; on our own unworthiness and nothingness, being framed from dust and ashes; on the benefits received, publick as well as private; on our creation, preservation, on remission of sins by repentance towards God, and belief in Jesus Christ; on grace, and on the hopes of eternal glory in a future state, according to our behaviour in this.

19. These reflections with prayers, thanksgivings and petitions, agreeable to them offered at stated and not unfrequent times, and always with energy of soul; will create devout, habitual and virtuous habits of duty; and counteract every vicious inclination.

20. The causes of feelings of duty repeated at stated times, even without much attention, will on deficient repetition excite an uneasy disposition of mind.

21. The energy of mind may by degrees excite fervency of devotion equal to the passions, and reduce the passions to feelings of inferior force.

22. May the time come, when nation shall no more wage war with nation; when mankind shall perform their respective duties in their several stations; and when they shall incite each other

other to every devout, good and moral action; and all shall treat each other as brethren, and join in promoting their mutual happiness, both here and hereafter.

23. Inferior feelings productive only of amusement to the mind, generally pass away like shadows, as soon as the object is removed: of this sort may be sublimity, beauty, dignity, grace, and all slight feelings; when not connected with terror, passion or utility; but these may by repetition, fashion, custom or some other cause or humour influencing the mind, take such hold as to become its principal object, and produce conformable effects.

24. The causes of feelings and their effects are associated together, as found by nature or accidents.

I. To conclude this subject, reason and universal experience proclaim every thing existing to have a correspondent cause: no argument, no experience ever indicates a probability, and I may even add a possibility; that works of the greatest power, wisdom and goodness can come into existence, can be constantly supported by weakness, ignorance and malevolence; and what is inferior to the greatest weakness and the greatest ignorance by nothing: a proposition contradictory in itself; which never can be credited but by idiotism or madness: there must necessarily be as much power, wisdom and goodness

ness contained in the cause as in the effects; and generally may be concluded much (unless contradicted by weakness and ignorance contained in them), and in the Creator of the Universe infinitely more: from him every thing else, mediately or immediately received existence, every thing depends; he is our support, our stay, our benefactor, Lord and God.

2. Chance is a word, which has relation to knowledge and ignorance, and not to beings or substances; to affirm that any thing came by chance is an improper expression, and means only that we are to some degree ignorant how it came; but all nature, the power, wisdom and goodness contained in all its works, proclaim aloud with certainty their Creator infinitely powerful, wise and good.

3. Has not the Almighty Creator and Governor given laws for the direction of our thoughts and actions?

May not laws be equally promulgated by the established constitution of things (a general language) as by words? The Almighty has published the laws of inanimate things, which collected from just observations never deceive; has he not also given laws to beings endued with freedom of will and understanding, laws to direct their thoughts and voluntary actions? Or is it a thing indifferent in whatever manner

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a rational being acts? Is no preference to be given to some actions or modes of acting before others? Does not all mankind agree in commending gratitude for benefits received, and soliciting their continuance by petition and prayer; and in praising every benevolent action, which promotes a particular or general good; and in reprobating every thought or action contrary to them? From these general principles, the acknowledged voice of all mankind, can from human understanding be deduced natural religion, piety, humanity and temperance? But has the Almighty established laws by the whole rational creation understood and assented to, of good and evil; and do not all mankind agree in annexing rewards to what are deemed good actions and punishment to evil? Do not all legislators annex rewards and punishments to the performance and breach of their laws; without which the promulgation of them would be folly: has the Supreme established universal laws through the universe, and will he not reward or punish their performance or transgression? Shall they never be enforced? Has he not further instilled in every mind, a general belief of a future state of rewards and punishments; a belief which always affords pleasure, in the performance of what is believed to be a good action, and sor-

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row or remorse in what is believed an evil one.—These principles are as general in the rational creation, as the laws of matter in the inanimate one, and will the God of truth deceive us in the one, more than in the other?

5. He is our comforter and friend in every affliction and temptation, in every place and every time; from whom we receive every blessing in this life; and from his power and goodness derive our hopes of future existence and happiness; hopes, that afford us a constant source of consolation in our passage through this world and death; the bare supposition of their falsity when reflected on with energy, creates in every mind, extreme dread and horror: an assured belief of such hopes, would make us account every thing of this world but dung.

6. Every animal is desirous of continuance in life, and esteems it some degree of happiness; analogous to this, must not every animal, which reflects on futurity be earnestly desirous of life in a future state, and particularly of a life given by an infinitely powerful and good being; from whom nothing can proceed but good, unless occasioned by demerit: as it is the desire of every one to attain eternal life, eternal happiness; it becomes his interest,

his

his duty to pursue those steps, that course of life, which he believes to contribute to the attainment of it, to be the laws, the commands of the Supreme; but every one that believes in a future judgment, will be desirous of learning how to escape the punishment merited, by his disobedience to the divine laws, by his crimes: from the divine goodness, which ever leads to mercy; no doubt, but means will be afforded; from human reason, no other can be devised than repentance, sorrow for our sins and amendment of our lives; but the Almighty will superadd whatever in his infinite goodness and mercy may seem proper to supply their deficiency; his mercy, his goodness forgives us our sins, and gives us the victory, through the mediation and sufferings of Jesus Christ.

6. Before the coming of Christ into the world sacrifices were almost universally adopted for the expiation of sins; but soon after his appearance and sufferings, they were abolished, and a worship in spirit and truth in general cultivated.

7. No false, no absurd religions arising from vices, from various sources, can invalidate the true; no more than ridiculous and absurd arguments can refute those, which reason and experience clearly discover to be true.

ON LANGUAGE.

1. Language is not only useful for communicating our ideas to each other, either by converse, writing or printing ; but generally is the basis of all our knowledge : very few can think or reason in their own minds without the words, which express their thoughts tacitly occurring, for it is not necessary for these purposes to hear the sounds of the words ; men think and communicate their ideas to themselves in language.

2. What may be the case of persons who were born deaf, and have never acquired words, is not easy to determine ; they may probably have a train of ideas from sight, which may afford them a ground for thinking, as language does to others, though more imperfectly : there have been instances of persons born deaf, who have been taught to read ; such perhaps may be able to acquire the habit of thinking in language ; without the use of it, our knowledge would be very deficient, we should sink into the state of brutes.

3. Sounds can never be like any other sensations but sounds ; nor is an articulate sound, framed from a similitude to the sounds of several letters conjoined, like any other sound, that I have

have ever heard: hence articulate sounds have not the least resemblance to our ideas excited by them; and a fortiori, the sounds of the words can never express the least similitude to the ideas excited by the several words contained in a sentence, the relations, agreements and disagreements; and consequently the sounds of the words never express our sentiments, otherwise than as arbitrary substitutions for them.—If the words did express the sentiments, or excite conformable emotions, they must be understood by every one, who hears them; but will any one read a sentence to a person entirely ignorant of the language, in which it is contained; and seriously ask him for the sentiment or emotion expressed?

4. In some cases, perhaps, this opinion has originated from the same word being often used in different meanings; and it not being unusual to associate the different ideas which the word denotes; e. g. the swiftness of reading any words can never give the idea of the swiftness of running, but from association.

5. By association the sounds and sense are connected together: similarly words and tones; different modes of reading as to swiftness, slowness, &c. different positions of the words and sentences produce in our minds ideas, relations and feelings, correspondently to what they have

usually done in past experience: a person, who has been accustomed to hear devout psalms sung, will have devotion excited in his mind from the hearing of similar tones, though he does not understand what words are sung.

6. When persons converse, study, or read; do they reflect on the sentiments or meaning signified by the words, or on the words themselves? I believe, very seldom much on the sounds of the words, unless excited to it by something uncommon; viz. the not understanding the meaning from some cause or other; or some peculiarity in the expression: to exemplify, if one person says to another; will you go with me to London on Wednesday? The consideration in the mind of the other, is only the question asked, the sentiment, but not the sounds of the words; will, you, go, &c; and his answer will be an agreement, refusal or doubt, without any attention to the sounds: the same sentiments being always excited by the same words has created a persuasion in some minds, that sounds are an echo to the sense.

7. The next enquiry is concerning the pleasure contained in the speaking and hearing of the sounds of words.

First, when the meaning of them is not understood.

Is

Is there much or any pleasure received from speaking or hearing single syllables, i. e. to us uncompounded sounds? If there be any sensible pleasure received, is it greater in syllables of more clearness, strength or weakness; in the same words consisting of as many or as few syllables as possible; of more vowels or consonants? If no considerable pleasure is contained in speaking or hearing of single syllables, is there much of single words or more conjoined, i. e. sentences? But if considerable is contained in speaking or hearing sentences, and little in single words; does not the pleasure arise from the understanding noticing agreeable and correspondent lengths of the lines, words, and pauses, and similarity of sounds, frequently and regularly occurring with proper variety? The same words or sounds too often recurring will not be pleasing.

2. The reader soon adapts his reading to the occurring similarity, and readily falls into the abovementioned correspondent pauses and endings, which perhaps thence create a more pleasant reading and hearing.

3. But is there much pleasure contained in the reading or hearing of the most harmonious versification, of metre or rhyme, without a pleasing meaning conveyed by it to the mind? Read passages of Homer, Virgil, Milton or even

Pope,

Pope, to a person entirely ignorant of the meaning of the words, as I have done, and you will soon be convinced of the little pleasure contained; he will soon be weary, and probably inclined to sleep: those words will commonly be more agreeable, which are more conformable in sounds to words contained in the language of the hearer; and read in tones correspondent to it.

4. It has been justly observed; that no person reads well, or gives true force to sentences, or pleasure to his auditors, who does not understand the meaning of what he reads; i. e. does not read by sense: both this and the little pleasure received by an unintelligent auditor prove the little force or pleasure of words, metre or rhyme, independent of the meaning.

5. The meaning of a sentence will be the same on whatever word the emphasis is placed; the emphasis denotes the superior force of the idea or thing signified by the word, and generally a stronger negation of its opposite.

8. The next enquiry, which follows in order, will be the pleasure excited by the harmony or rhyme, when the meaning of the words is, 1. imperfectly, and 2. perfectly understood.

1. If the hearer or reader only imperfectly understands the meaning of the words; his mind will study for their meaning, as of the
more

more importance, without any attention to the harmony.

2. If he perfectly understands the meaning of them; his mind on the first reading or hearing will be almost principally on their meaning, and very little or not at all reflect on the harmony; though it might have been formerly the object of his study.

3. A man can seldom divide his attention so as to fix it much on two subjects at the same time; for by constantly varying his attention from one to the other, he will be a very indifferent master of either: if a person reads a book or hears any facts related, and another desires an account of the book or facts; he in answer commonly gives an account of the sentiments contained or related; and seldom mentions any thing concerning the style, harmony or diction, as things less worthy of observation; but if he does, it is commonly something in general terms concerning the clearness and obscurity of the writer or speaker, as being the most material.

4. Whatever pleasure may be contained in the harmony, it is soon forgot; for as soon as the words are forgot, the harmony contained in them must be so too: and therefore the little pleasure contained in the harmony seldom remains longer than the bare time of the reading.

5. I believe

5. I believe very few persons commonly read verses aloud to themselves for the pleasure of their harmony or similarity of sounds: and still more few to others, unless scholars to their masters; who read them, not for the pleasure of the sound of the metre or rhyme to him or themselves; but for instruction of versification from him in its established rules often derived from authority and not the ear.

6. The excellence of the harmony, &c. can only be judged by the reading and the ear; the ancients reduced harmony to measure or metre, by certain rules: the first is, that the times of pronouncing correspondent lines should be nearly equal; and their parts, pauses, i. e. emphases and accents, in some degree analogous; to measure the time of pronouncing any line; they assumed, as an hypothesis, the time of pronouncing one long syllable to be equal to that of pronouncing two short ones; this cannot be exactly true; for if there be a difference between the times of pronouncing the longest syllable and the shortest, there will probably be different intermediate times of pronouncing other syllables: two short syllables do sometimes run in some degree into each other; and a long one sometimes lengthens the sound, and breaks it nearly into two: the time likewise depends on the emphases, accents and breaks; no rule is given for the measure of these: there
should

should be a small break between every two words, otherwise the words will run into each other, and the reading will be indistinct; all these considerations will render the times of reading different correspondent lines somewhat different.

9. It has been asserted, that different kind of verses agree to different subjects; verses of certain forms, viz. lengths, feet and pauses, best express the different passions; others are better calculated for narration: from what principles can their forms be deduced, whether from the lengths and pauses of sentences generally expressive of the passions, or applied to narration: but how far are they deducible from nature, and how far from authority and fashion? The belief of any thing, of which no proof is given from reason and nature, may be deemed prejudice, till such a one is deduced, and a conformity to it, named fashion, whether acquired from education or otherwise: no mathematician gives credit to any propositions contained in Euclid's Elements from his authority, but from demonstration; in the same manner no credit is to be given to a writer in any science, (matter of fact excepted) but to his proof: truth and demonstration of it are immutable; whatever is variable, depends on fashion; how

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far

far is metre variable or different in different places and times?

10. Is not the harmony, the pleasingness of the verse to be judged by the ear, and not determined by rules? Let a person unprejudiced either by education or otherwise, read Homer's verses and judge of their harmony by the ear, and if his ear does not differ from those of some others, nothing very pleasing or harmonious will be excited in it; but perhaps versification does not create any great degree of pleasure, independent of the meaning.

11. Can any harmony therefore whatever compensate for an inversion of language: no harmony of it can be excellent unless it can be easily pronounced and understood.

12. The composition of verse will be rendered more difficult, the more restrained it may be as to pauses; whether by stops, emphases, accents, ending of words, length and similarity of sounds.

Rhyme is generally more difficult than blank verse, as including both metre and similarity of sounds; and commonly more agreeable than blank verse to the young, as I have found by the examination of some individuals; does the preference of blank verse depend on nature, or on the lessons received in younger days; or on both?

13. Have

13. Have not the Greek and Latin languages from the endings of those substantives and adjectives, which agree together, having often a similarity of sounds; and from the words contained in the same sentence, being capable of any position; whatever a great advantage in rhyme; though seldom or never in use with them?

To conclude the great, the grand and almost the only use of speech, is to convey our ideas, sentiments, interests and purposes to each other; and that which does in the most clear manner convey ideas, sentiments and images to the minds of others is to be preferred; as far as those ideas, sentiments and purposes extend.

14. The senses of hearing and seeing are the only ones which generally receive ideas from bodies at a considerable distance, and very imperfectly from bodies in contact; the eye only in the direction to which it points, and the ear in every direction; the eye may see, when there is no sound; and the ear hear, when no vision.

15. Language being instituted as before said for the communication of our ideas to each other: its excellence must principally consist in the ease of pronunciation and facility of its being understood by other persons and learnt; and its containing the words necessary to communicate our ideas, sentiments and feelings.

16. The vowels being the easiest letters to pronounce; the ease of pronunciation of a syllable will consist in the greater proportion of vowels to the consonants, and the fewer letters particularly consonants, contained in it.

In the first respect, the Greek is superior in ease of pronunciation to the Latin; and the Latin to the English; and in the second, they are both superior also, for they generally contain as many syllables as possible, and the English as few; this may perhaps give the English a greater dignity or strength of sound, and the Greek a greater softness.

17. The facility of a word's being pronounced depends on the facility of the pronunciation of the syllables composing it; and the facility of a sentence on that of the words contained, and its not being too long.

18. For the greater ease of pronunciation to the speaker; and also the communication of his ideas to others with a proper degree of quickness; the original words should not be too long; the derivatives which express some relation of them, will commonly be still longer.

19. With the use of our present alphabet, and by one, two or three letters being contained in each syllable, and one, two or three syllables in each word, there will result more different words than compose all the languages of Europe;

Europe; but different relations, variety, and other reasons, admit and even require a further latitude, perhaps three, four or even five letters in a syllable, and as many syllables in a word; but to this greatest extent very seldom, though there are syllables of more letters and words of more syllables.

20. It would be much for the ease of pronunciation, that two consonants in the same syllable should not often follow each other; and that some of the most difficult in pronouncing should be rejected from the alphabet; but let us not lose any sound that we have acquired.

1. Let m and n denote respectively the number of vowels and consonants, then will the number of different sounds resulting from one vowel only be m ; the number resulting from two vowels, or one vowel and one consonant will be $m \times m - 1$ and $2 m n$ respectively; their sum $= m + m \cdot m - 1 + 2 m n \equiv m^2 + 2 m n$.

The number of sounds from three vowels or two vowels and one consonant, or one vowel and two consonants will be $m \cdot m - 1 \cdot m - 2$, $3 m \cdot m - 1 \cdot n$ and $3 m \times n \times n - 1$ respectively, of which the sum is $m^3 + 3 m^2 n + 3 m n^2 - 6 m n - 3 m^2 + 2 m$, to which add the abovementioned sum $m^2 + 2 m n$; and there results the
number

number of all the different sounds made from one, two or three letters; of which no two in the same word are the same.

In the same manner may easily be investigated the number of sounds, which can be framed from 1, 2, 3, 4, $\times$ letters; but too many letters can with difficulty be joined in the same sound.

If in the former case the sounds are excepted in which two consonants are joined together, subtract $2 m . n . \overline{n-1}$ from the abovementioned number resulting.

2. Let N be the number of different sounds; then will the number of words consisting of one, two, three, 4, 5, ... r different sounds or syllables be $N + N . \overline{N-1} + N . \overline{N-1} . \overline{N-2} + N . \overline{N-1} . \overline{N-2} . \overline{N-3} + \dots + N . \overline{N-1} . \overline{N-2} \dots \overline{N-r+1}$

Example. Let m , n and r be respectively 6, 20 and 2, then will $N = m^2 + 2 m n = 276$; and the number of words resulting $= N + N \times \overline{N-1} = 276 + 75,900 = 76,176$.

3. If the word consist of (r) syllables, of which a of them be a , β of them be b different to a , γ of them be c different to a and b , δ of them be d , &c.

Let words of the abovementioned kind, be denoted by $a a b \beta c \gamma d \delta$, &c.; then the number

ber of the different words of this sort resulting from the different situation of the syllables may be denoted by a fraction, of which the numerator is $r. r-1. r-2. r-3 \dots 3. 2. 1$, and denominator, $1. 2. 3 \dots \alpha \times 1. 2. 3 \dots \beta \times 1. 2. 3 \dots \gamma \times 1. 2. 3 \dots \delta \times \&c.$

On similar principles may be investigated the number of words consisting of any number of syllables; each of which consists of any number of vowels, consonants; and semi-vowels or letters, which placed before a vowel, may be considered as a consonant, and after it as a vowel.

21. If the meaning of the words be not accurately determined, the meaning of the sentence, i. e. the sentiment expressed by them cannot; define therefore the words, contained in the sentence, and commonly its truth or falsehood will clearly appear: to exemplify this, it has been disputed how far some arts or compositions are imitative; define the word imitation clearly and determinately, and it may thence be deduced how far they or any parts of them are correspondent to it: similarly define tragedy and comedy, and it will be easy to determine whether any given story or representation be either tragic or comic or mixt, or neither of them: in the same manner define the different kinds of poetry, and it will easily appear in what class any

any given composition should be placed. Are these distinctions arbitrary, or deducible from nature, from the sources of utility and pleasing? But whatever may be the answer to this question, it may be useful to distinguish writings as other works, into a few general sources; but often such matters are not accurately defined, and admit of great latitude.

22. The meaning of words or passages contained in authors, should be determined from authority or similar passages: if the sentiment seems low or absurd, it is a laudable practice amongst commentators to alter the words, so as to improve the sentiment and render it as excellent as possible, consistently with any appearance of truth: but is it commendable to spend much time in the correction of words or passages; which when corrected, are neither useful nor excellent? truth and excellence seldom require much time for correction or alteration, they speak for themselves.

23. The facility of the sentiment being understood by other persons depends on the voice of the reader or speaker, on its loudness and tone being conformable to that in which they have been accustomed to hear reading and speaking; it further depends on the different parts, neither being repeated too swift for the mind to comprehend each part clearly, nor too slow so as to occasion

casion it to rove to other matters; on an emphasis being laid on the principal word marking it for attention; on a proper rise and fall of the voice; on the words repeated being easily to be distinguished from all other of a different meaning; and lastly on the words in the sentence being placed properly, those which are connected with each other together, as the substantive and its properties, whether natural or accidental; and whatever connects two substantives, expresses their relation, being placed between them, the agent preceding when the relation is active, the patient when it is passive; this must be the case when the agent or patient, their properties or attributes, the agency or suffering, and the relation is not prædicated by the beginning or ending of the words expressing them; the order or meaning may be deduced from the terminations if properly instituted; but it will always be preferable, unless on account of variety or harmony, to place them in their proper order, it not giving the understanding the trouble of reducing them.

3. Between each syllable should be a very short break, between words a greater, and between sentences a much greater; hence in a line of a given number of syllables, the reading *cæteris paribus* will be slower as there are more words contained.

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4. The

4. The more letters are contained in a syllable, the longer generally is the time and the greater the difficulty of pronunciation: if to any syllable we add a letter at the beginning, middle or ending of it; we endeavour to add somewhat of the sound of the letter in that place, this renders its pronunciation more difficult and more long.

5. The tones to a small degree probably differ in every age; and consequently the tones in which we read dead languages, are very unlike those in which they were read when living.

6. The goodness of the language must be proved by authority from the compositions of the best writers, from Grammars and Dictionaries; some regard being had to utility, otherwise no language could ever be improved: the excellence of metre and rhyme should be judged by the ear and not by authority; unless that authority deduces the rule from nature, in this case, the ear.

7. Particular names are given to the persons and things with which we are most conversant; but if names were given either to every individual substance, attribute, accident, relation, and connection; the learning and retaining the language, would be impossible to man, and would not be useful without abstract or general ideas in general reasoning; converse and
reason-

reasoning would only relate to particulars; and probably not be understood, as both might not be acquainted with the same.

8. One word may be made to denote some affection of the mind, a very complex idea, or whatever the mind pleases; but it must be explained to them with whom we converse, by enumerating its simple ideas and their connections.

9. Most languages have words, which may express every thing necessary in their respective states; and if there were not, persons in a civilized state, would soon supply the deficiency; this happens when any new plant, earth, metal, animal, country or people, &c. are discovered; for names are immediately affixed.

10. Hence no sentiment expressed in Greek but can with equal facility be expressed in Latin or English; hence also an amazing number of words expressing substances contained in the modern but not in the ancient languages; viz. the number of words for metals, semimetals, earths; for plants and animals; amusements and recreations; operations and tools in agriculture, gardening and various machines; for chemistry, a science almost unknown to the ancients; anatomy, its words being made principally from the Greek, but we do not count the

primitive English words only, they are probably few; but every word that is used in the English language, whether coined or taken from the Hebrew, Greek, Latin, French, Spanish, Italian, &c. must be deemed an English word; *for* philosophy; astronomy; mathematicks; &c.; medicine; jurisprudence; politics; &c.; in each of these sciences many things are now known, which were unknown to the ancients, in addition to all that were known by them; and therefore a great many words are contained in the English, which have no correspondent ones in the Greek, but few in the Greek which have not correspondent ones in the English; in a similar manner may we argue concerning the remaining parts of speech.

11. It has been said that some languages have many words, which signify exactly the same thing: is it to be deemed an excellence or a fault; when to avoid the too great copiousness of words, it is necessary that many words should have several, sometimes very many different meanings, metaphorical, allegorical, figurative, personified, relative, &c.; that several words should signify exactly the same thing, to the overburthening the memory to no useful purpose? but does it not seem probable that the moderns, having recourse to all the present and
past

past languages, should be the most liable to coin more words expressive of the same thing, having borrowed them from the different languages; but it is best, if they have generally avoided it.

12. It must be acknowledged, that the moderns have acquired their superior copiousness of language, by being posterior; the same advantages probably will future ages have of the present, if it may be esteemed any: every people will generally acquire a language correspondent to their state and time.

13. A great advantage of one language in preference to another is, *cæteris paribus*, the superior facility of its being learnt; and this is greater in living than dead languages.

The vernacular languages are probably more easily learned and understood than the Latin and Greek; they are more easily learned, because of the many different terminations of the names and verbs contained in the Latin, and particularly in the Greek; and more easily understood, because their words are placed in a more natural order: future languages will probably copy the moderns in both.

14. Plain and simple language is most useful in conveying knowledge, and in converse; but figurative often impresses sentiments with greater energy on the mind.

15. Civilized

15. Civilized nations having communications with each other, both by their writings, and otherwise; and it being almost impossible to learn all the different languages, therefore it may be useful to establish one general language, which should pervade all the different States, and be the means of communicating to each other all useful knowledge and inventions; such at present is the Latin as before said, which is generally learned by the literati of every place.

Rome, at the same time that she extended her conquests, rendered her language universal.

It is useful and necessary for merchants, travellers, &c. to learn the language of the nation in which they trade or travel.

16. The greatest use of learning Greek, Hebrew, &c. is the acquiring a critical knowledge in the sacred writings, to which every thing that is relative bears a relation, has the greatest consequence; otherwise, would it be worth while for many persons to spend several years in learning a very difficult language, perhaps the most difficult in the world for the knowledge of the arts and sciences contained in them? It is readily granted that the arts and sciences received great improvements from the Greeks, but they are all rendered in our own language with great additions, so that no one applies to them on that account:

count: would many spend so much of their time in acquiring the language for the sentiments, histories, and stories contained in those sentiments, histories, &c. may, and all of much consequence have been translated: a sentiment literally translated, will be exactly conformable to the original: for if every word in the translation has precisely the same ideas annexed, there can be no difference in the sentiments; the language in the translation may probably not be elegant and agreeable to the idiom of the original, as the idioms of different languages are different. But will any one waste his time in studying a language merely for the words contained in it? If a word in the original has two different meanings, it will probably lose its false wit in the translation; but if it has only one meaning in the original, and two in the translation; it may on the contrary acquire similar wit.

THE PARTS OF SPEECH.

1. The ideas of the mind either are of substances, and their properties or qualities inherent or accidental; relations, actions, or sufferings, to which add feelings.

2. The parts of speech are; first, noun substantives, which denote the substances and feelings; to which add modes, artificial collections of

of ideas, as real substances are distinguished by natural collections; and also whatever stands by itself, and requires not another word to join it.

3. Some particular noun substances more often used in speech, have been distinguished by the name of pronouns; as I, thou, he, we, ye, they, &c.; in the same maner also correspondent adjectives; many of which are connective.

4. A noun adjective is either a property inherent in the substantive; or not inherent, but accidentally happening to it; which is most commonly derived from its having done or suffered something, and is called a participle; some adjectives are also derived from other parts of speech.

5. Verbs are words generally denoting either doing or suffering, and consequently have relation to time.

Time in itself is naturally divided into past, present, or future; but when it has relation to some action, or suffering, it may have as many tenses as a person pleases; it may be as before, past, present, or future; beginning, middle, or ending; either more or less, before or after any of the preceding; and various others: these may all relate either to liberty, or obligation; supposition; certainty or chance, which last may either be implied in the expressing the chance

chance simply, or a wish or prayer for it; they may be expressed in command or desire or interrogation, more or less for the present or future; with many others.

6. The infinitive mood has so far the appearance of a substantive as it stands by itself, and may be changed into one: for let the verb be the infinitive mood of, to do, or, to be done; we ask, "to do what," or "what's to be done?" Let the answer be, it; then will the command "to do it," or "it's to be done," both signify the same, ^{and} command the "doing of it," &c.; i. e. to do, or to be done, means the doing of, it; all the tenses differ only in relation to time, and may be so expreit,

7. There is also a verb, which denotes existence, not action or suffering; and sometimes the substance acting or suffering is omitted.

8. Substances, adjectives and verbs, as other parts of speech, may generally and mutually be changed into each other: the substantive into the adjective or verb, by expressing a property of another substantive, somewhat similar to a property of it, or an action similar to its actions: the adjectives, verb, &c. may be changed into a substantive, by supposing their properties and relations independent of any substantive, for then they stand by themselves; the adjective may be changed into a verb by sup-

posing an action to produce an effect similar to the property of the adjective; and the verb into an adjective by annexing it to a substance, that is, supposing it an accidental property belonging to it; and similarly of the rest.

9. We have few words to express the relations of what are called the secondary qualities, when those qualities are different; but when they are similar, we ^{generally} express the comparison, the greater or greatest strength or force of the quality in the English language of them, by affixing *ar*, or, *β*, to the end of the word expressing it.

10. The words expressing the relations of the primary qualities, the understanding and will, would be so numerous, if a word was affixed to every relation, &c., that it would be impossible for any language to contain them: many words in most languages are derived from the relations of extension and motion, these words generally denote a great number of different relations, which the mind collects either from the memory of former instructions, or from the substances between which the relation is contained; and the meaning of the word in cases allied, in some degree, metaphorically: but the metaphors in many cases are so different and so indeterminate, having no apparent similarity, that they can hardly be pronounced such;

such; of this, the prepositions to, for, from, by, with, &c.; a great number more are examples: it must be acknowledged that the mind in reading these relations never refers them to any others, of which they are metaphors; and consequently never considers any similitudes between them; they cannot therefore with propriety be called metaphors.

11. What has been advanced in this place may equally be applied to adverbs, relations of verbs, as prepositions, and relations of nouns.

12. Conjunctions either join two sentences together, or separate them; if some part of the two sentences be the same, join or separate the remainder and add the common.

13. These prepositions, &c. respectively having their different meanings in most languages express by the same word indicates their derivation from the same origin, and their usefulness and difficulty argues the origin to be divine.

14. Since no advantage or pleasure is contained in the reading or hearing of any sentence whether in prose, metre or rhyme, without its being understood, and understood without difficulty: the words whether in prose, metre, or rhyme must be properly arranged, and read by laying proper emphases and accents on the principal words and proper pauses or stops between the different sentences; intermediate or conclusive,

and the relations interposed between the things related *A* and *B*; but between these things *A* and *B*, may be interposed different relations contained between *C* and *D*, *E* and *F*, &c. or facts, which are necessary to evince or enforce the truth of the relation contained between *A* and *B*; but some or all of the relations between *C* and *D*, *E* and *F*, &c., may be placed after the relation between *A* and *B*, for they will equally prove or enforce that relation however situated or arranged, when examined with a sufficient degree of attention; but the more natural, strong and uniform ^{in which} the order, the relations or things, are placed, the more easily will they be apprehended and remembered: between any two things not immediately connected together there should be a proper stop or pause according to its deficiency of connection.

15. Pauses or stops should only be placed, where the sense requires or at least admits them, and particularly not in the beginning or middle of a word, for it renders one word as it were two; some liberty may sometimes be taken in this case, when the sentence is too long, or for the sake of versification, but this is always objectionable.

16. In some cases where the substantive or action and relation stand absolute without reference to any other, either may be placed first,

first, for the meaning cannot be misunderstood.

17. In languages, of which the construing of sentences cannot be deduced from the different terminations of the words, the words which have no different terminations should be placed in a proper order to the words, to which they bear relation; but this order is often inverted, and it cannot be entirely reversed without the confusion of all language; e. g. the nominative case in the English may be placed between the accusative and the verb, if they precede the verb; and for a similar reason the accusative between the nominative and verb, when they follow it; but sometimes, very seldom, this order is reversed in cases which admit of only one meaning: words related to prepositions may commonly be placed in any part of the sentence; this inversion of words may sometimes please the ear by its variety and harmony: inversion of language is therefore principally used in metre and rhyme.

18. Rhyme cramps the genius or debilitates the sentiments more than metre, and metre than prose; for the more a person is obliged to study for words, the less regard can he pay to his sentiments.

ON THE ACQUISITION OF LANGUAGE AND ALPHABETS.

If mankind were situated in a state analogous to the brutes, without knowledge and without language, would they by their faculties acquire subsistence and language?

1. If they were situated in such a state, they would act as the brutes do; no two males would generally associate together; it would be a state of war between them, for the females, food and other causes (converse and known utility being the bond of their mutual association require language and knowledge); their daily employment would be the search of food; but brutes, by the supposition in knowledge equal, are much superior in instinct more necessary for such a state; the earth naturally produces food proper for brutes, but not without culture and cookery much food healthful and necessary for man: if we enumerate every article of provision in our present, what is contained in them that would have afforded us subsistence in the state described? We know that, generally, in a great scarcity of corn and vegetables, which are only procured by cultivation, in any country, the inhabitants would be famished, unless assisted by their neighbours: were a man turned adrift into an uninhabited country

country without tools and seeds necessary to the cultivation of the ground in order to his support, he would probably soon be starved to death; add to this, mankind is not well clothed and guarded against cold and other occurrences; and further, beasts of prey roving about without controul would soon extirpate the human race; or were there no beasts of prey, other animals would increase and multiply so much, as to render the procuring of food difficult.

In contradiction to this, there have been two or three instances of persons living in such a state; but no good account has been ever given of the time they were first exposed, or of their manner of living.

2. The care requisite for rearing a child is so much greater and longer in duration, being many years, that the mother would probably forsake the child before it could provide for itself; the female in the brute creation generally forsakes its young soon after it is impregnated again, at which time, and even on its second and third delivery, when the mother is helpless and stands in need of assistance, the child would not be able to procure food and necessaries; the mother is generally more weak and disordered on her lying in than any other female animal, ill suited to the state of the child; and perhaps

perhaps her instinct is less; there are a great many instances of women destroying their children and forsaking them, even in their state of knowledge and of moral obligation, as well as instinct; but few of brutes: further, the cause of the mother's dying before the infant could provide for itself, would in such a state not be much less than the chance of her surviving; add to this, the chance of her being attacked by sickness in that time, which would render her incapable of administering to the infant's wants; and the probability of the death of the child in that interim for want, would be greatly increased.

3. Divine providence has placed every animal in a state suited to its wants, abilities and nature; in this, great latitude is used; they are situated in almost every state consistent with their existence and well being; but man is nowhere placed without speech and knowledge proper for him: nature has endowed man with reason and understanding necessary to his support, but not to be acquired without language; by which he deduces and provides from past experience, what is necessary to his future existence and well being; but does nature ever give latent faculties without affording the proper means of acquiring and using; faculties even
 necessary

necessary to his support here and happiness hereafter?

The Supreme Being when he first created terrene animals, probably created them in manhood and perfect state, not in infancy in which they could not provide for themselves; and gave to man language, and to other animals voices necessary to their respective states; as is agreeable to the Mosaic relation. But if mankind could have subsisted in such a state, could he further have acquired the use of language?

4. Is it probable, or even possible, when mankind must be continually roving about in search of food, and only attentive to their appetites and passions; when the mind, though possessor of latent faculties of reason and invention, (the improvement and extent of which entirely depend on the exercise) has never applied or exercised them to any considerable degree? Could man in such a state frame a great number of sounds unusual to him, and substitute them for substances, for their properties inherent or adventitious, for relations, actions and all other parts of speech? He must have been a profound metaphysician so as to be master of all ideas and their relations contained in the mind and its feelings; he must have been superior to all grammarians, having framed the sounds

for all those ideas, relations and feelings himself, and every thing necessary for the time; he must have substituted some words for an infinite number of different relations, which when applied to a particular substance or action can only have one meaning: subjects which require several years of a man's life even to learn, who is ultimately seldom perfect in the knowledge and philosophy; could these inventions greater, more extensive, more difficult and useful than any ever found by the sublimest genius, in its highest cultivation of mind, be invented by mankind in a state little superior to the brutes? At first, languages more than necessary to his support, to converse concerning matters in the state in which he is placed, and moral duties, would not be given; he would have the means of adding, when necessary.

4. Men would begin to cut likenesses of things, either for their amusement, or for communicating to others, or preserving the memory of facts; these likenesses would soon after be drawn by fluids on any substances, which figures drawn by some fluids would be found to remain, and hence would be produced something analogous to pen and ink.

The moral laws given to the first men would in some generations be forgot, debased and corrupted; a new revelation would be given of them

them from time to time; but in proper time, on the increase, &c. of mankind, it would become necessary to give written laws for their general publication and continuance; these would probably be given to a distinguished people who merited such communication; but sometime before the publication of these laws, an alphabet and reading should be given for the understanding of them.

5. An alphabet might be framed from any known language in the following manner.

Observe the syllables which are easiest of pronounciation in the language, these in several languages will be found to be *a, e, i, o, u*; assume these for first letters; then assume about sixteen or twenty of the next easiest, for the second class; there is no occasion to proceed to any further class; join two or three (in most cases not more) of these letters together, in which, for the ease of pronounciation, always include one of the first class; and try, when joined together quick, or run into each other, what sound would be produced, and it would be found in general, that they would very seldom, if ever, run into one sound; therefore create a sound, having some likeness to the two sounds, or rather being between them, which should correspond to some syllable contained in the language; but if some syllables contained in the

language are found not to have the least similitude to the sounds produced by any combination of his letters, for those syllables frame a new letter.

Affix marks for the letters as fancy directs, the easier, if distinguishable, the better.

There are two more vowels *y* and *w* contained in our alphabet, which seem to be consonants, when placed before a vowel.

6. Almost all the alphabets have probably been borrowed from each other; the Roman not only borrowed, but even took the Greek alphabet, to which they added about four letters; so some person observing, what the Greeks in reading always pronounced their vowels *a*; *e*; *i*; *o*; *u*; when they constituted a syllable alone, took their pronounciation, and thence arose the vowels, *a*, *e*, *i*, *o*, *u*; for the *e* long, and *e* short, and *o* long, and *o* short, when pronounced alone became one sound; they pronounced the consonants as the Greeks pronounced them, some with an *e* before and some with an *e* following them; in this enumeration the *z*, and perhaps the *r*, must be excepted—the Greeks pronounced most of their letters by words of two syllables, which is certainly a fault in any alphabet, for it seems proper to pronounce the vowels as they are pronounced where they stand in a word or constitute

ture a syllable by themselves, and the consonants as they read them with a vowel affixed: but the Greeks had ^{in some} a meaning as to the length or accent, as ο—μικρον and ω—μεγα, and ε—ψιλον and υ—ψιλον, and they might in the others, for any thing that is known to the contrary: the Romans also took the characters as well as names from the Greek alphabet.

7. The modern alphabets (the Russian excepted) in all polite nations are become nearly the same, and probably their languages may for some reasons by degrees approach.

8. Most languages have clearly originated from each other, as appears from the correspondent words and idioms of them.

9. Languages and alphabets, as far as we can judge from history, seem to have been rendered as perfect as necessary on their first origin, and not to have proceeded gradually, as all human inventions ever must.

10. Sentiments and knowledge may be communicated to others, either by writing or printing: where the communication is only from one to another, writing is to be preferred, for we must write the copy first to have it printed; but where many copies are required to render the knowledge diffusive, printing is to be preferred, both on account of the less trouble and expence, and also of the greater correctness.

11. In

11. In writing, no man's attention can be so fixed as only to attend to the part writing, but it will rove to other parts, and sometimes to other matters; these will often create inaccuracies: but in printing, such inaccuracies will be corrected by one, two or more correctors; but notwithstanding this superior advantage, errata will arise even in printing, through the inattention of the correctors, for they cannot be so attentive but that some errata will escape them; and particularly if the mind be employed on other subjects at the same time; but if every erratum was corrected, some small letters, particularly in mathematics, as in the denominator (I speak from experience and authority) will often drop, and if it be after the last correction, will occasion an erratum in the printed copy; the dropping of one figure or letter, may increase or diminish a quantity in any given ratio; but this is of no great consequence, for generally the erratum may be collected, from the quantity, being a particular case of a general rule, or the preceding reasoning; and every intelligent reader will understand, and cannot mistake.

12. In regard to future editions of books or writings, it may be observed that as long as the original continues legible, and the language perfectly intelligible, so long may the memory of

of them be said to remain exact; but when they depend on written or printed copies, &c. some few errata from the abovementioned sources, most probably of no great consequence, are to be expected.

13. All persons for want of leisure, time and means, have it not in their power to procure the artificial language of reading and writing, but the present institutions of some benevolent persons will, I hope, in time, greatly diminish this evil.

14. Various causes may injure the hearing or occasion impediments of speech; the latter may happen either from a fault of the organ, or when the organ is perfect, from being brought up and educated with some who have an impediment themselves, or a different tone of voice, and other causes; when this is the case, age and converse of others of a proper tone may often produce a cure; or the endeavouring, deliberation, attention and every effort to pronounce the difficult words as plain as we possibly can: quære, whether Demosthenes was not cured more by this method, and time, than by the pebbles.

15. Impediment of speech and probably any default in a man's body or voice, generally produces bashfulness; and the former, with weakness of voice, is a sure bar to a person excelling in public.

16. In

16. In default of hearing, an artificial language may be substituted from the sight; and in default of both hearing and seeing, one from the touch; but deplorable is the situation of those who can neither hear nor see, a state to which old age approaches, for the sight becomes dim and the hearing dull.

Should it please Providence thus to deprive me of the use of my faculties, may I submit with humble resignation. May I for the future lead a life better in practice, and more fervent in devotion to the Supreme Being; and may God grant me his grace here, and pardon of my sins, when the trumpet of the great Archangel shall summon me to life again, and to judgment.



ADDENDA.

A D D E N D A.

Page 49. 1. Let $N_2, N_3, N_4, N_5, \dots, N_{m-2}, N_{m-1}, N_m$ be the respective number of ways that 2, 3, 4, 5, ..., $m-2, m-1$ and m letters can, in the same number (m) of letters, each of them be placed out of their respective places; then will $N_2 = 1, N_3 = 1. 2. 3 - 1 - 3. \frac{2}{3} \times N_2 (3) = 6 - 1 - 3 = 2,$

$$N_4 = 1. 2. 3. 4 - 1 - 4 \times \frac{2}{3} \times N_2 (6) - 4. \frac{3}{2} \cdot \frac{2}{3} \times N_3 (8) = 24 - 1 - 6 - 8 = 9, N_5 = 1. 2. 3. 4. 5 - 1 - 5. \frac{4}{3} \times N_2 (10) - 5. \frac{4}{3} \cdot \frac{3}{2} \times N_3 (20) - 5. \frac{4}{3} \cdot \frac{3}{2} \cdot \frac{2}{4} \times N_4 (45) = 120 - 1 - 10 - 20 - 45 = 44, \dots, N_m = 1. 2. 3 \dots m-1 - m. \frac{m-1}{2} \times N_{2-m} \cdot \frac{m-1}{2} \cdot \frac{m-2}{3} \times N_{3-m} \cdot \frac{m-1}{2} \cdot \frac{m-2}{3} \cdot \frac{m-3}{4} \times N_4 - \dots - m. \frac{m-1}{2} \cdot \frac{m-2}{3} \cdot \frac{m-3}{4} \dots \frac{3}{m-2} \times N_{m-2} - m. \frac{m-1}{2} \cdot \frac{m-2}{3} \dots \frac{3}{m-2} \times \frac{2}{m-1} \times N_{m-1}.$$

2. The number of ways that m letters only, contained in n , can be out of their places, will be

$$n. \frac{n-1}{2} \cdot \frac{n-2}{3} \cdot \frac{n-3}{4} \dots \frac{n-m+1}{m} * N_m: \text{ the}$$

H h

number

A D D E N D A.

number of all the ways possible for the letters being in or out of their places is $n \cdot \frac{n-1}{2}$.

$\frac{n-2}{2} \dots 4 \cdot 3 \cdot 2 = L$; the chance of the happening of any of these events is equal to their number divided by L .

Hence by Mr. De Moivre's elegant problem on this subject,

$$\frac{Nm}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \dots m-2 \cdot m-1 \cdot m} = \frac{1}{2} - \frac{1}{2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} - \frac{1}{2 \cdot 3 \cdot 4 \cdot 5} + \dots + \frac{1}{2 \cdot 3 \cdot 4 \cdot 5 \dots m}$$

3. The chance of r given letters out of n being contained in their places is $\frac{1}{n \cdot n-1 \cdot n-2 \dots}$

$$\frac{1}{n-3 \dots n-r+1}$$

Cor. Hence the number of letters being infinite; the odds will not be so much as two to one against the whole number being out of their places; but the odds will be infinite $\times^d$ into infinite $\times^d$ into infinite $\times$, &c. ad infinitum to one against the whole number being in their places; and infinite raised to any power l to one nearly against any l given ones being constituted in their places; hence their being constituted in order, proves a design.

4. By

A D D E N D A.

4. By adding more of these numbers together, we shall find the sum of the number of ways that m, r, s , &c.; or 2, 3, 4, .. m letters out of n can only be out of their places.

The same principles may be applied in similar cases, when the number of letters of one species be h , of a second k , of a third l , &c.

Sm will always be divisible by $m-1$.

Page 109. Reaumeur, discovered the velocity of light, from which Bradley accounted for the aberration of the fixed stars.

Page 166 and 171. The near representation of a given object is a thing of which every man can judge: a specific figure, by which I mean a fair representation of the species, should be formed from a great number of particulars: a characteristic form to express any one excellence the species is capable of, will be best taken from some individual of the species eminent for that excellence: in these two last cases the study and observation of nature are necessary to enable a person to judge.



C O R R I G E N D A.

PAGE 8. l. 6 and 7, *for the picture on the retina is, read their pictures on the retina are.* l. 10. *for the object subtends at the eye, the, read, an object subtends at the eye, its.* p. 26. l. 13. *for seem, read seems.* p. 41. l. 4. *for from, read deducible from.* p. 48. l. 4. *for a being, read beings.* p. 56. l. 5. *dele self.* p. 74. l. 16. *for annexed, read annexed to it.* p. 79. l. 15. *for extends, read-extend.* p. 85. l. 11. *for and, read and he.* p. 100. l. 5. *dele,.* p. 106. l. 20. *for minds, read mind.* p. 107. l. 9. *read philosophy are.* p. 133. l. 20. *for principal, read principle.* p. 120. l. 22. *dele in.* p. 128. l. 22 and 23. *dele war in.* p. 133. l. 22. *for deems, read deem.* p. 134. l. 6. *for such, read are such.* l. 14. *dele is.* p. 196. l. 3. *after wisdom, read benevolence.*

